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SMOKELESS AIR

The Smoke Abatement Journal

Special Issue No. 1 **Autumn, 1939**

Commentary

TWO issues of the new Smokeless Air had appeared—successful and widely appreciated—and the third was well under way for publication in the middle of September, when the crash into war came. It would have been a good number, and, as up to the time of writing things have been quiet on the home front, it would have been possible to publish it. A number of advertisements were, however, cancelled, and it was considered that the wisest thing for the Society to do was to cut out all avoidable expenditure as soon as possible and to try to conserve its rather meagre reserves. The type and illustrations are there, however, and it is still hoped that it may be possible to use them before they are entirely out of date. In the meantime we are going to try to keep in touch with all our friends by means of news and information bulletins, of which this is the first.

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Some progressive bodies will find their work vastly increased as a result of the war; others will have to mark time until peace returns. Smoke abatement, at first sight, seemed to be one of the unfortunates. For one thing, stringent fuel restrictions must destroy, for the moment, the basis of that change to smokeless methods upon which our case is built. Then, in all probability, the conditions which modern warfare must enforce upon a nation will leave little room for the evolutionary movements of peace time. And lastly, from a material viewpoint, we are still uncertain (although optimistic) as to how far our income will be maintained. But, although some of its work must be suspended, the Society is not going into a state of coma, and indeed new lines of useful and necessary activity are already becoming apparent, although until the nation gets into its new rhythm of life it is not easy to see what exactly it will be feasible to do.

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It has been suggested that the Society should now encourage the production of smoke with a view to baffling enemy aircraft ; but a smoke pall will indicate the presence of a densely-populated or industrial area even more than it may conceal specific objectives, and a smoke plume may well betray the presence of an isolated factory that might otherwise be unnoticed. Rather more urgent is the need for continuing the control of factory smoke emission, if for no other reason than that this is one of the signs of wasteful combustion and of fuel losses. The waste of fuel that goes on in this country is always shocking, and now, when every scrap of energy must be put to good use, it is little short of unconscious sabotage. Local authorities therefore should not slacken their observations and control over industrial chimneys, but, in national as well as local interests, should if anything keep more carefui watch than ever. The rationing of coal for domestic purposes will lead to an automatic reduction of domestic smoke, and if, by more careful firing, this is made to go further, there will be an even more substantial lessening of smoke. This will be of especial benefit, for in the coming winter we shall need all the light and brightness we can get.

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This anticipated reduction of smoke pollution during the war makes it important that, except when it is quite unavoidable, the observations that form the chief part of the Investigation of Atmospheric Pollution shall be continued without a break. Not only would it be a great pity if the continuity of many years' work was to be broken, but the records to be obtained during the war period may well give the most striking comparisons with preceding years and, perhaps, with the years that will follow. We hope in a subsequent issue to indicate what is being done to keep this important work in being and in the meantime trust that those who are concerned with the investigation will do all they can to carry on as usual.

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The offices at Chandos House are closed and the three members of the staff are all engaged on full-time national service work. Mrs. Gilders is with the V.A.D. ; Mr. McGhie, making use of his legal training, is working with the Finchley Corporation ; and Mr. Marsh, turning to new kinds of fuel and stoking problems, takes on a Food Control job in Epsom. His home in that town is the Society's wartime office, and in his spare time he will continue to be the Society's Secretary. It is hoped that members will continue to write, that news will continue to be sent along, and that inquiries will continue to be made.

The Cost of Smoke

One of the subjects to have been discussed at Blackpool was a report on the economic losses due to smoke. This would have contained a review of our present knowledge and proposals for extensive new investigations to be carried out in co-operation with the assistance of experts and representatives of the principal trading and administrative interests most directly affected by a polluted atmosphere. These proposals will now have to wait, but the opportunity was given, during the summer months, for conducting a most useful preliminary investigation in a limited number of channels. The work was carried out by Miss Marion Fitzgerald, who is an experienced investigator, and whose name is well-known to all who are concerned with smoke abatement. The inquiry was made possible by the British Commercial Gas Association, who had requested the Society to obtain for them information on this aspect of the problem, and who were therefore interested to hear of the proposals for a large scale investigation that were to have been put forward.

Miss Fitzgerald's report was to have been included in the paper to have been read at Blackpool, but its completion was upset by the outbreak of war, Miss Fitzgerald having to devote her time to A.R.P. work. It is therefore not yet possible to publish a synopsis of the many interesting and illuminating facts and figures obtained, although it is hoped that a full account will be available for the next issue of this bulletin. In the meantime it may be said that the inquiry has been well worth while, both for its immediate results and in indicating the lines upon which a more extensive long term inquiry should be conducted.

The statistical information obtained from large concerns shows that the serious economic losses revealed by previous investigations persist to a similar degree, and indicates that the more detailed figures that would be obtained by a long term inquiry would be highly impressive. Many items of a non-statistical nature have been obtained and strengthen still further the economic case against smoke. One of the most heartening aspects of the investigation was the friendly and understanding co-operation given on all sides. In many cases the trouble due to smoke deposits was known and already appreciated, and in others the reasons for the inquiry were quickly grasped. It is, for example, significant when the officer responsible for the maintenance of the premises of a large multiple shop firm is found to have a black list of towns where cleaning, repairing and decorating expenses are found always to be excessive. The inquiry was confined to manufacturing and commercial undertakings (including banks, etc.), and did not touch the wide but difficult domestic field.

From the Unpublished *Smokeless Air*

Below are extracted some of the principal points of interest from the articles and reports contained in the ordinary issue of Smokeless Air that should have been published this autumn.

Greenwich Observatory.

In an interview with the Astronomer-Royal, Dr. H. Spencer-Jones, the reasons were given for the decision to move the Royal Observatory, which has been at Greenwich for 264 years, to a district with an unpolluted atmosphere. Conditions have gravely deteriorated at Greenwich since about 1921, as a result of extensive housing and industrialisation in the area. Atmospheric transparency is so reduced and is so variable that instead of the work of the Observatory expanding it is actually diminishing. Before 1921 Greenwich used to have sunshine figures in excess of those at Kew, but since then has progressively received less and less. In the period 1935-38 it recorded an annual average of 158 hours less than Kew, compared with 65 hours more than Kew in 1916-20.

Programmes of observation have had to be dropped, photographic exposures are longer (and therefore less in number) and even the meridianal observations, for which the Observatory was originally founded, are hampered because of the difficulty of making observations on stars at low altitude to the north.

That is not all, however, for the deposits of dirt and grit interfere seriously with the delicate instruments used, the accuracy of which has to be most precise and constant. This involves expense and much loss of time. New types of aluminised mirrors, employed with success elsewhere, cannot be used at Greenwich because of the rapid tarnishing and loss of reflective power as a result of sulphur pollution.

For the present another serious trouble will have been removed, namely, the glare in the night sky. This was due to bright artificial lighting being scattered and reflected by the suspended impurities in the atmosphere. In a perfectly transparent atmosphere there would, of course, be no glare at all, so smoke is indirectly responsible for this problem also.

William Murdoch.

This autumn should have seen the celebration of the centenary of William Murdoch (1754-1839), the pioneer of scientific coal utilisation and the father of the gas industry. An appreciation by I. Berkovitch, B.Sc. Tech., of his life and work would have been of interest to every reader. Murdoch was a remarkable man and a prolific inventor in diverse engineering and chemical fields, and, says the author, "to us whose concern is smoke abatement, his work in the sphere of coal utilisation is of the greatest significance."

Other Items.

A third article on "The Outline of Smoke Abatement" dealt with the deposition of smoke and the nature of the deposit. It showed that the reduction of solid deposits in London during the past 25 years has been accompanied by an even greater reduction of sulphur compounds deposited. There has been an average reduction of 48 per cent. in solids and of 55 per cent. in sulphur compounds.

A report of the successful "Sunlight or Smoke?" exhibition, organised by the North-Western Branch at the Central Library, Manchester, stated that there had been an attendance of 12,537. Much interest was shown and numerous inquiries were made to the stewards. Many of these were about smokeless solid fuels, and seemed "to show that while north country people dearly love an open fire, they would prefer on the whole to enjoy it with a clear conscience."

Notes on behalf of the electrical industry considered the need for "fume abatement" and the question of exhaust gases from motor vehicles. Low temperature carbonisation notes dealt with the opening, by Mr. Geoffrey Lloyd, Secretary of Mines, of the new Bolsover oil refinery—the first continuous refinery of its type in Britain, for the production of a wide range of finished products from crude coal oil. Notes from the gas industry gave an account of the new flats of the L.C.C. at the White City, which although not smokeless, will all be responsible for less smoke.

An interesting account was given of a very comprehensive report on the smoke problem in France, drawn up by the French Ministry of Health for the Housing Commission of the League of Nations. This included an account of the Loi Morizet, which was adopted by the Senate in 1932, and which precisely and unambiguously laid down that "the emission of soot dust or grit or of poisonous or corrosive gases liable to cause inconvenience to the neighbourhood, or to pollute the atmosphere or damage the public health or security, or agricultural production or the maintenance and good condition of monuments, or local amenities is forbidden in all industrial, commercial or administrative establishments." It is said that this law is really unenforceable, but remains a powerful weapon in the hands of those in the neighbourhood of a factory whose smoke is excessive.

The Regional Committees.

The West Lancashire and Cheshire Committee reports the annual meeting held in June, and the smoke abatement section of a "Brighter Homes" exhibition which was attended by 80,000. The problem of pollution from railways in cuttings in Liverpool continues to receive attention. Measurements in the vicinity of cuttings in Liverpool continue to be made with the automatic filter.

The Midlands Joint Council refers to investigations in connection with the emission of fumes from the casting of non-ferrous metals. A survey taken by the Council suggests a definite need for Byelaws under Section 104 (2) of the Public Health Act, 1936. relating to the provision in new buildings, other than private houses, of such arrangements for heating and cooking as are calculated to prevent or reduce the emission of smoke. A novel form of pollution is reported : the deposition of paper ash from plant used to reclaim aluminium from the foil wrappings so extensively used in commercial packing.

The Manchester and District Committee gives an account of the annual meeting and of the progress made towards the formation of a statutory Board for South-east Lancashire.

The Greater London Advisory Council reports the completion of the membership of its Executive Committee and the setting up of sub-committees : one to deal with technical problems including smoke observations and grit nuisances, and the other to examine the possibility of recommending methods for reducing domestic smoke either by inducements or penalties.

The Sheffield, Rotherham and District Committees sends in a long report dealing largely with research work on coals used for small Lancashire boiler plants. Many coals have been tested and among other things it was noted that the tendency to produce smoke increased with the size of the coal, especially at low rates of combustion.

New Reports

The Alkali Inspector's Report.

The 75th annual report of the Chief Alkali Inspector deals with smoke problems at some length, and again reviews the position in respect to burning spoilbanks. A comprehensive survey of all burning spoilbanks has been made and a provisional list of 312 spoilbanks drawn up. Many inspections have been made and the problems considered in a systematic and thorough manner. It is pointed out that the problem of colliery waste disposal has been accentuated by the demand for coal of low ash and sulphur content, and consequently by more intensive methods of cleaning. "Thus it may legitimately be argued," says the report, "that the local nuisance caused by burning spoilbanks is to some extent offset by the avoidance of more widespread pollution which would be caused by the distribution of coal with high ash and sulphur content."

The formation of two new advisory smoke abatement committees is said to be gratifying, and the hope is expressed that the example may encourage the formation of further committees in other industrial areas. A report is given on the tests on the sulphur content of the flue gases emitted from the power stations at Battersea and Fulham, which shows that the remarkably high degree of purification previously obtained is being maintained. At Battersea (on 953 works tests) a chimney emission of 0.030 grain of sulphur per cubic foot of dry gas at N.T.P. was recorded, while for Fulham the figure was 0.0082 grain.

The Sheffield, Rotherham and District Committee.

The ninth report of the committee records over 10,000 observations during the year (to 31st March, 1939) with an average of 1.65 minutes smoke emission per observation.

The Committee accepted the offer of the local Manufacturers' Committee to arrange for Mr. E. C. Evans, technical expert of the British Iron and Steel Federation, to visit Sheffield and investigate the conditions which he found to exist at works where smoke is emitted in excessive quantities, and make a report with recommendations for the improvement of such conditions.

The investigation was carried out and the report considered by the Statutory Committee. The Committee agreed that the report did not deal with the question in the way in which they had expected Mr. Evans would deal with it, that the Manufacturers' Committee be informed the Statutory Committee were not satisfied with such report, and that the report had not modified their view that it was desirable that Section 109 of the Public Health Act, 1936, should be repealed forthwith.

Subsequently a deputation from the Manufacturers' Committee attended the Statutory Committee in regard to the report, The deputation agreed to recommend that the Manufacturers' Committee should reverse their former policy and make efforts, within reasonable limits, to induce hitherto recalcitrant firms (whether members of the Associations or not) to co-operate with the Statutory Committee in regard to the diminution of smoke in metallurgical processes. The Statutory Committee accepted the offer, and agreed that a list of the offending firms should be furnished to the Manufacturers' Committee in order to see whether the "pressure" to be brought to bear by the latter committee on the firms concerned would have any effect, such arrangement to be limited to a period of twelve months.

The report of the Chief Inspector (Mr. James Law) is as interesting as usual, and has many valued observations on metallurgical and boiler smoke problems, as well as upon other problems such as from coke oven plants, burning spoilbanks, dust and fumes, domestic smoke and refuse burning.

Chicago's Big Survey

An extensive survey has recently been started by the Work Projects Administration on air pollution in Chicago and its vicinity. The size of the project can be gauged by the fact that £78,000 has been appropriated for it.

Six interrelated studies are being undertaken. First comes visible smoke, then dust and noxious gases, and then the origin of dust and noxious gases. An examination of ultra-violet and visible light penetration through the atmosphere is the fourth subject. The fifth is a comprehensive abstraction of scientific literature on air pollution, and the sixth is the collection and codification of legal opinions and decisions.

The smoke of Chicago is being watched as never before: observations of chimneys, to give complete minute by minute records, are being carried out by 250 men, and the information is being tabulated and recorded on master punch cards. The statistical information then available will, it is said, make it possible "to obtain a correlation of smoke with any of the multiple possible combinations of type of plant, kind of fuel burning equipment, type of boiler, kind of coal burned, cause of smoke and atmospheric conditions at the time smoke was produced."

Through a search for new methods of examining deposits it is hoped that it will be possible to determine with accuracy the source of origin of any soot or grit—in other words, to evolve a method of "finger printing" soot particles.

The proposed review of existing literature should be very valuable. Pertinent material will be located, catalogued and abstracted, and inter-indexed so as to make information on any phase of air pollution readily accessible and understandable to any person interested in such data.

"Would it be fair to suggest that the public health has suffered almost as much during the past hundred years from dirty air as it has gained from clean water ? At any rate, I do submit to you that the physique of growing children cannot be satisfactory so long as that heavy cloud of smoke and filth, which covers our most thickly populated areas, contaminates the air from which they derive their very life."—*The Earl of Harewood, at the Royal Sanitary Congress, Scarborough.*

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MOKELESS AIR

The Smoke Abatement Journal

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Ships, towers, domes, theatres, and temples lie
Open unto the fields, and to the sky;
All bright and glittering in the smokeless air.
—Wordsworth

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"SMOKELESS AIR" is published quarterly by the ional Smoke Abatement Society. Editor : Arnold Marsh, c. Tech., M.Inst.F. Wartime Address : 94, Manor en Road, Epsom, Surrey. Telephone : Epsom 1867.

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Commentary

Slipping Back?

IN our last issue it was rather optimistically anticipated that there might be a reduction of smoke during the war. There are signs, however, that a change for the worse is more likely, not only because the domestic fuel restrictions have now been completely removed, but because of increased industrial activity. There can be little doubt that the latter is not always being accompanied by due regard for fuel economy, nor that the control of nuisances by the local authorities has, in many areas, been relaxed. From one area we are told that "our activities have been suspended, our staff being engaged on other urgent duties, and, believe me, the city is filthy at the present time. It has certainly brought home to me the fact that we had made much more progress than I ever realised." The correct policy is well summed up by Dr. Johnstone Jervis, M.O.H. for Leeds, who in a recent communication writes: "I would stress the importance of keeping the cause of smoke abatement constantly in the public eye. We are not dropping it in Leeds; the Inspectors are as busy as ever, notwithstanding the exigencies of the times. The excuse for breaking the law regarding the emission of smoke which one so frequently hears, viz., that munitions or armaments or some other kind of work is being undertaken—is one which cannot be entertained. In war, as much or more than in peace, the health of the nation must be maintained, and must have first consideration."

The Society

The Society's change-over to the new conditions imposed upon it by the war has resulted in a simpler but effective form of organisation that we hope will enable us to surmount whatever difficulties may lie ahead. Many lines of activity that were being developed are now no longer appropriate and although, as the new statement "Smoke Abatement in Wartime" shows, there is much useful work to be done, it is not always a simple matter to discover how best it can be done, bearing in mind our own circumstances and the peculiar conditions under which work such as ours must now be carried out. The outlook is, however, far more promising than was at first considered likely, and a real interest in smoke abatement continues to be evident in spite of the more pressing problems that now beset us. An understanding of the need for continuing to keep the Society in a sound and active condition is also shown by the ready renewal of subscriptions by most of the members so far concerned. A few subscriptions from trade members, unfortunately more substantial than most, have been discontinued, but generally there has been a gratifying and encouraging response to the appeal for continued support made in the letter sent to members month by month as their subscriptions become due.

War and Peace Aims

"Smoke Abatement in Wartime," which is being circularised with this magazine, might be looked upon as an exposition of the Society's war aims. As the last section of the statement points out, problems such as this do not disappear because there are greater problems to be dealt with, but increase unnecessarily the new burdens forced upon us by war. The smoke abatement movement came into being in the national interest, and it is fitting that it should continue to work, within the limits imposed by new conditions, even in days so critical and momentous. The war will end, and with peace will come urgent new tasks of constructing a better world. Construction to-day demands the application of science—*inter alia* in sociology, in health, in the development of our towns, in the use of raw materials, and in the production and use of heat and power. In each of these basic questions of modern life and well-being there enters, somewhere, the factor which is our especial concern: the ending of the present injurious and costly pollution of the air. It is only one question in a countless number, but it is important, and it is therefore important that all those who understand it should keep together and continue to give it their attention. Thus, although the war in many ways limits our progress as a propaganda organisation, it should be possible for us to work more actively on the lines of a scientific society that is concerned with the study of one specific subject.

An Invitation

"Smoke Abatement in Wartime" is a short statement only, and one or two of the matters referred to could with advantage be considered much more extensively. This applies particularly to the important questions touched upon under the heading "A National Fuel Policy." We should very much like to receive, for publication, any letters, comments, or short articles from readers on these or other subjects. In the absence of conferences it is important that discussions among ourselves, with controversy where that is helpful, should continue, and this can be effectively done in these pages. Discussions in a quarterly are admittedly rather slow, and perhaps it adds to the difficulty of writing when it is thought that next week will do as well as this. This may account for the scarcity of such contributions (for it cannot be believed that every reader always agrees with all that is said), especially when the abundance of oral discussion at our meetings is recalled. As that opportunity is for the present denied those who have something to say or to criticise they are invited to write—promptly.

New Readers

The circulation of the new full size "Smokeless Air" had been built up to 2,500, and we are trying to keep this figure up with our present diminutive editions, even though this means distributing some copies without charge for the purpose of creating interest in new quarters. We shall, therefore, be glad to send specimen copies (and copies of "Smoke Abatement in Wartime") to persons whose names and addresses are sent to us. Incidentally, additional copies of the pamphlet can be obtained on request from any member who can make good use of them.

A New Poster

One of our publicity plans for this winter was to have been the distribution of a new pictorial smoke abatement poster, which is reproduced from the first prize winner in the competition held a short time ago by the Society. It may be recalled that it is an arresting design of a hand stretching upwards to the sun, with the caption "Away with smoke—let in the light." The printing of the poster was completed just before war broke out, and we now have several large parcels waiting for the time they can be used. No general demand for them can be expected at present, but we shall be pleased to receive orders from any members who can display them—in Public Health departments, schools, fuel offices, electricity and gas showrooms, and at lectures. Printed in four colours, size 30 by 20 inches, the poster is sold at 6d. per copy, or 5/- per dozen.

The Seven Ages

Mr. R. H. Clayton, of Manchester, who is a member of the Executive Committee, has been actively interested in smoke abatement for over thirty years, and has been responsible for a number of new and effective ways of looking at various aspects of the problem. For example, his Presidential address to the Manchester Section of the Society of Chemical Industry in 1909 was entitled "The Conservation of Finished Products," in which it was cleverly shown how the interest in the conservation of raw materials was followed by a neglect of the finished products, which deteriorated and were damaged in a polluted atmosphere. Mr. Clayton has now suggested an admirable theme for a popular pamphlet entitled "The Seven Ages of Man in Smoky Cities." His seven ages are not quite the same as those of Jaques, and are (1) pre-natal; (2) the baby; (3) the child; (4) youth—boy and girl; (5) married life; (6) old age; and (7) death. We can see that when the time comes again for using a pamphlet of this description it will be possible to draw up something very telling. The idea can be worked upon now, and we shall be glad to hear from any readers who care to try their hand at developing it.

The Regional Committees

Reduced Activities

The reports obtained from the Regional Committees are mostly negative in character. This is only to be expected, for the Committees comprise local authorities only, and the representatives upon them have been, and are, heavily engaged in many wartime duties.

The West Riding of Yorkshire and the Northumberland and Durham Committees have suspended their activities, and the Manchester and District Committee is particularly unfortunate in that once again the proposed scheme for the establishment of a statutory Joint Board has had to be dropped—this time when "the purpose for which the Committee has been working for so many years was on the point of achievement." It is, however, hoped that the project may be revived as soon as national circumstances permit.

Dr. W. M. Frazer reports on behalf of the West Lancashire and Cheshire Committee that it is hoped to continue the organisation of the Committee, and, as opportunity permits, arrange meetings and deal with inquiries. Two of the constituent authorities have recently raised questions with regard to grit and underfeed stokers so that it appears that interest is still being maintained. It is noteworthy that over 150 mechanical underfeed stokers have now been installed in Liverpool and that smoke abatement work is being continued.

Dr. W. R. Martine (Birmingham), Secretary to the Midlands Joint Advisory Council, writes stating that he was called up for military service before the outbreak of war. Health departments in the area have been sadly depleted of inspectorial and other staff, and for that reason the work of smoke abatement perforce had to be cut down. The Council have decided to defer meetings until at least a year has elapsed, the position to be further reviewed thereafter. Communications should still be addressed to the: Honorary Secretary, c/o Public Health Department, Birmingham, where they will receive attention as hitherto.

The Greater London Advisory Council has recently issued a report to its representatives and constituent authorities, stating that it is proposed to suspend its projected work for the time being, but to sustain interest by means of the circularisation of "Smokeless Air" and the issue of other reports. It is suggested that in view of these reduced activities, but bearing in mind the need for maintaining the funds of the Council, the annual subscription should be reduced for the period of the war to £1 1s. per annum for all constituent authorities.

The position of the Sheffield, Rotherham and District Committee is, of course, different, as this is a statutory body engaged upon routine smoke observations and similar work. Most of the work has had to be relaxed, but a certain amount is still being carried out. Atmospheric pollution records are being continued and though, so far, no very rapid rise has been shown, the figures are definitely showing heavier pollution already.

This is a disconcerting fact, and adds point to the plea previously made for a continuation of the atmospheric pollution observations. In this connection Dr. J. S. Owens, Superintendent of Observations for the Investigation, reports that the work is still continuing, and although some stations have had to suspend observations during the war, a large number are carrying on. Thus he hopes to maintain continuity and considers that there should be some interesting data as to the effect of the war on the purity of the atmosphere.

THE COST OF SMOKE

Miss Fitzgerald's Report

The investigation on the cost of smoke to commercial and retail concerns, which was carried out during the summer, was briefly reported in the last issue of this periodical. The full report on her work has now been completed by Miss Marion Fitzgerald, and in spite of the fact that it was a short term inquiry only and had to be concluded in haste at the beginning of the war, this is a valuable document, both for the facts it reveals and the way in which it indicates the lines upon which the desired long term inquiry should be developed.

As the time of the inquiry was so limited attention was given only to quarters from which it was considered data could be secured without undue difficulty, and which were in a position to make comparisons between conditions in clean and smoky districts. Approach was therefore made to firms of multiple shops of different types, to one of the large banks with branches in all classes of area, and to bodies which were known to be affected by smoke in specific ways, such as jewellers and libraries.

The report is full of interesting material, and therefore to avoid undue compression it will be discussed both in this and the next (Spring) issues of "Smokeless Air."

Multiple Shops

Very significant evidence was received from a firm with over 1,100 branches in all parts of the United Kingdom as to the amount of repainting and redecoration necessary to keep their premises in smoke areas clean and attractive.

"The firm's maintenance surveyor," says the report, "knows the worst 'black spots' by heart, and can tabulate them in their degrees of blackness without hesitation. The Sheffield and Rotherham District and the Pottery towns occupy a bad eminence at the top of the list. In the Pottery towns and Sheffield the shop fronts need washing down and re-varnishing every twelve months. Following them comes the Manchester district, which includes Salford and the towns of south-east Lancashire, and stretches out to Ashton-under-Lyne and Hyde; next in order the Birmingham district, including Wolverhampton, Dudley and Walsall, followed by Leeds, Glasgow and Newcastle-upon-Tyne, with London (taken as a whole for conditions vary greatly there) at the bottom of the Black List."

Exterior decorating is needed every three years in clean districts, every two years in moderately smoky districts, and every year in the worst spots. On the average it is estimated that three-quarters of the shops require redecorating twice as often as the one-quarter in the clean situations. Although the desired figure in cash has not yet been obtained from the firm, it will be seen that the cost of exterior decorating alone is increased in the proportion of 4 : 7 as a result of the dirty conditions.

From another large firm the information was received that 50 per cent. of the shops are in smoky districts, and that the costs of redecorating them are from 25 to 33⅓ per cent. more than in the case of branches in the comparatively clean districts.

The architect of another firm owning 620 shops stated that it was "quite safe to say that our costs in keeping the exterior of our buildings in smoky towns up to our standard are 15 per cent. higher than for buildings in non-manufacturing towns."

Again, there is a loss not due to increased costs but to an avoidance of costs leading to reduced standards that are as undesirable in business as they are in the home. This is clearly brought out in a reply from the director of a firm of shoe manufacturers which has many retail shops in the North of England. "Undoubtedly," he says, "the decorating, polishing and upkeep of retail shops such as ours, where situated in a bright atmosphere, is less costly than those in Manchester and similar places, but I do not think that I could put forward any figures to confirm that. What happens is that the Manchester places remain dirty three-quarters of the year and the others are comparatively clean the whole time, and they are both subject to the same form of decoration."

Banks

This line of inquiry has produced the best statistical results so far, and this is due to the interest taken in the investigation by one of the chief officials of a large bank with many branches in industrial and non-industrial as well as in country districts. The bank was asked if they could give a conservative estimate of what air pollution cost them by comparing the expenses of cleaning and redecorating their smaller type of branches in clean country districts and in smoky areas respectively. It was considered that the small branches offered the best basis for the experiment because they are common in the country districts as well as in the inner and more smoky districts of large industrial towns, and being more or less the same size they offered fair comparisons.

The estimates were made by a sampling method which took the form of a questionnaire to ten branches in clean areas and ten branches in dirty towns.

One item was *the frequency of cleaning windows*, which gave the following results :—

Internally : For every 10 times in clean areas, 14 times in dirty areas.

Externally : For every 10 times in clean areas, 13 times in dirty areas.

Cost ratio : For every £1 spent in clean areas, £1 10s. spent in dirty areas.

A further item concerned *the frequency of painting and decorating* :—

Externally : For every 10 times in clean areas, 11.3 times in dirty areas.

Internally : For every 10 times in clean areas, 13.5 times in dirty areas.

Cost ratio : For every £1 spent in clean areas, £1 8s. spent in dirty areas.

An examination of *the costs ratio for cleaning materials*—that is, the purchase of such materials—shown that for every £1 spent in clean areas, £2 10s. is spent in dirty areas.

Particulars with respect to *special cleaning* were also obtained. In no instance is special cleaning required in clean areas, but most branches in dirty areas find special cleaning is required sometimes as frequently as once per month.

In all but the last two items (cleaning material and special cleaning) it is obvious that the contrast would be much greater but for the almost universal custom of painting and cleaning windows at routine periods (as for example the habit of putting in leases that painting should be done at stipulated periods irrespective of local requirements). These contrasts, therefore, can be taken to show the extra work and cost entailed *per force* above customary work but not *actual* requirements—*actual* requirements in clean areas would, of course, not entail as much work as we do from routine.

Hotels

This section of the inquiry affords an excellent illustration of the difficulties encountered in trying to separate the effects of smoke from other agents that are stated to create expenses. Such factors include the effects of bright sunlight, on curtains, the action of sea air laden with salt or sand, and the dust and dirt brought into hotel rooms by the guests. The methods of accounting used again made it difficult to ascertain what costs could safely be charged to a smoky atmosphere.

Several interesting facts were, however, obtained. The exterior of one hotel, for example, in a big town with a high degree of air pollution, was washed in 1934 and again in 1939. The cost on the second occasion was £375.

A company owning nearly 200 hotels in districts ranging from completely clean to excessively smoky, stated that so far as the industrial districts of the North, the Midlands and the Pottery towns are concerned they have no doubt that air pollution involves them in considerably greater expense for interior decoration and for dry cleaning. They report that in certain towns they have had to resort to painting the bedroom walls instead of papering them in order that they may be washed once a year. They say definitely they themselves do not find the external upkeep as great in the seaside houses in spite of the strong sun and winds.

Aesthetic Loss

A point already referred to is brought out again by the maintenance engineer of another company. He said that generally speaking their country hotels were painted as often as the one in London, for although the former did not need it so much the company liked to keep them as nice as possible. "This point," comments Miss Fitzgerald, "appeared several times in connection with shops and offices, buildings as well as hotels. When premises are in clean districts they are kept clean because the standard is high. In smoky towns they become dirty quickly and are allowed to remain so until, in the case of shops, the next painting is due according to time-table ; in the case of hotels until a big function happens ; while city offices remain grimy indefinitely. So does a polluted atmosphere lower the æsthetic standard."

The concluding digest of the report will include information received from jewellers, libraries, property owners and managers, and the conclusions and impressions reached by Miss Fitzgerald during the course of the work she so very ably carried out.

THE SMOKE PREVENTION ASSOCIATION

A New U.S.A. Publication

The 1939 issue of the "Manual of Ordinances and Requirements," published by the Smoke Prevention Association of the United States, contains much valuable technical and legislative data, together with the papers that were read at the Association's annual convention in Milwaukee in June. Copies may be obtained for 50 cents. from the Association at City Hall Square Building, Chicago, Illinois.

One section is devoted to the tabulation of replies received from a number of cities in the U.S.A. and Canada on a detailed questionnaire issued by the Association. To the English reader the most striking feature is the wide differences in the standards and methods of legislation and administration, which is, of course, inevitable where each town or district has its own ordinances, framed and used according to the local conditions and, no doubt, according to local views upon the problem. These differences are best illustrated in a table showing the time periods of permissible smoke emission, which may be compared with our own standards of 2 or 3 minutes in 30.

In some towns no specified time limit is used. The most stringent limit is Green Bay, Wisc., with 3 minutes every four hours, but the most drastic regulation appears to be that for Salt Lake City, which has 1 minute per hour, with penalties of up to 299 dollars fine *and* six months imprisonment.

Schenectady allows only 75 seconds per hour, but at the other end of the scale we come to Hartford, Conn., which allows 8 minutes per hour, and a number of cities with 8 or 6 minutes. A feature of many ordinances is that a generous period is permitted for new fires and for fire cleaning. Birmingham, Ala., for instance, allows 30 minutes for a new fire, with 6 minutes in each consecutive hour. Elsewhere only 15 or 20 minutes is allowed for this purpose, and in Chicago 6 minutes.

Five hundred dollars is the highest fine for any city, but a number of ordinances provide for imprisonment as an alternative or in addition. Wheeling, West Virginia, allows 20 minutes for fire building, but can impose a fine of 100 dollars or imprisonment for 12 months.

Discouraging Phases

A further tabulation gives the answers to questions grouped under the general inquiry, "What is the most discouraging phase of local smoke abatement activity ?" The factors specified, with the total number of votes recorded for each, are as follows :—

Lack of public smoke consciousness	14
Public indifference	15
Shifting responsibility	16
Poor fuel	29
Lack of proper burning equipment	40
Careless operation	58
Lack of information in proper methods of firing	31
Lack of enforcement facilities	20

The results are particularly interesting, and the marked agreement on the culpability of "careless operation," followed by "lack of proper fuel burning equipment," is what would be expected from any similar inquiry made in this country.

The Convention Report

In the section of the Manual recording the convention proceedings fifteen papers are printed. They are largely concerned with fuel and engineering problems.

Roy O. Johnson, Counsel to the Indianapolis Smoke Abatement League, in a paper on "What Smoke Means to a Community," estimates that one full-time inspector is required for every 50,000 of population, or about one full-time man to every six square miles. He states that the cost of smoke to his city is from five to six million dollars a year.

The Ringelmann chart is extensively used in the States as a standard of smoke emission, but it is of interest to note, in a paper by John M. Hodges, deputy smoke abatement engineer for Hudson County, New Jersey, that in practice it is not often used by trained smoke inspectors. He argues that it is nevertheless a very practical method of making observations and comparing smoke densities, and that in spite of inaccuracies it is the most convenient method yet devised.

Henry F. Hebley, of the Commercial Testing and Engineering Company of Chicago, contributes a paper on "Preparation and Quality Control of Steam Coals," which outlines the principles of the different coal cleaning and washing systems. There are also papers on railway smoke, on the properties of coal that affect burning characteristics, on fuel oil, underfeed stokers, smokeless combustion, legislation, and low temperature carbonisation. It is hoped to reprint in full, in a future issue, a paper by Dr. John P. Koehler, Commissioner of Health for Milwaukee.

It is hoped also to make further reference to a contribution on "The Smokeless Fuels Research Programme of the Illinois State Geological Survey." This is an account of a significant enterprise on a large scale for maintaining and developing the use of Illinois coals, in which full recognition is being given to the growing importance and need for smoke abatement.

News and Views

Sound Public Service

But this at least may be said: coal will prove to be one of our most valuable national assets; its supply for the essential requirements of the nation must be maintained, and the quantity available for export will provide a vital means of exchange. Since every ton of coal produced represents an appreciable demand on the man power of the country, its careful conservation is a public duty, and fuel economy is not only good business but sound public service of the most practical kind. To quote words recently used by the Chancellor of the Exchequer in the House of Commons: "While we are waging war against the enemy abroad, let us also wage war against waste at home."—*The Fuel Economy Review, Federation of British Industries.*

The Right Outlook

If fuel restrictions during the war remain such that we can satisfy our real needs, if we are rigidly economical, the country will emerge with the right outlook for the Smoke Abatement Society to forge ahead. For its object is to make us burn our smoke for our own warmth, and not to discharge it into the atmosphere for our suffocation.—*The Medical Officer.*

The National Interest

. . . It is, of course, wise that the N.S.A.S. should cut out all avoidable expenditure, but it would be a thousand pities if those who have helped the organisation to gather strength and, particularly in late years, to emerge into quite an important body influencing public opinion towards the best use of coal should not entirely withhold their support. . . . True national economy lies in the use of the valuable products which coal contains and will yield on carbonisation. More than ever now must the burning of raw coal in the domestic grate be regarded as national waste. The Society's aim for clean skies by the use of smokeless fuels in place of raw coal is undoubtedly in the best national interest.—*The Gas Journal.*

Our Future Scope

Progress has certainly been made in the elimination of individual industrial chimneys and in the reduction of soft coal consumption in domestic grates, but we have still a very long way to go before it will be possible to say that the smoke evil has been conquered. Indeed, there is reason to fear that 25 years hence there will still be plenty of scope for the National Smoke Abatement Society's activities.—"*Galvo*" *in* "*The Electrician.*"

A New Soot-Collector

A new type of soot collector has been installed on the chimney at Claridge's Hotel, London. The main principle is said to be an adjustable cone which traps the soot as it arises in the chimney, allowing only soot-free smoke to escape. The collected soot is shot into a special container which is emptied periodically.

The device comes from France, and the inventor, M. Celestin Triaire, won a prize offered by the Paris municipality for the most effective soot collector. It is hoped to obtain and publish more details of the method employed.

The City and Guilds

The City and Guilds of London Institute announce that the 1940 examinations will, as far as circumstances permit, be held as usual. This will, of course, include the examinations in boiler-house practice.

In the 1939 examinations in this subject there were 132 candidates, of whom 78 per cent. were successful, in Great Britain, and 5 candidates, of whom 3 were successful, in India. Examinations were taken in 19 centres in this country, Manchester leading with 19 candidates, followed by Sheffield with 12, and Glasgow and Bury with 11 each.

Of the questions asked the one most frequently answered (by 94 per cent. of the candidates) was: "What are the causes of smoke emission in a steaming boiler? Describe fully how such smoke emission may be reduced."

A proposed advanced course on Combustion Engineering has been considered, and it is agreed that there would be scope for such an examination. It is considered, however, that the time is opportune for the introduction of this course.

Methane

The imperative need for safeguarding our coal and petrol supplies can be achieved not only by using them in the most efficient and economical ways, but also by supplementing them with new fuels. One such fuel is methane, or marsh gas, which is available in large quantities at sewage works. Already in several places it is being collected, and at Isleworth, for instance, it is used to generate the electricity used at the sewage works, and saves £20,000 a year, although only a proportion is utilised. It is used in Germany and France, and is suitable for road transport purposes. It is estimated that in this country sixty million cubic feet per day are available. Combustion is entirely smokeless.

ATMOSPHERIC POLLUTION

From a Paper by James Law

One of the papers read at the Health Congress of the Royal Sanitary Institute in Scarborough in July last, was by James Law, Chief Smoke Inspector, Sheffield, Rotherham and District Smoke Abatement Committee.

The author begins by asking a question :—

Is the atmosphere of Great Britain becoming more polluted, or are we progressing in our attempts to make the air we breathe cleaner than in the past ?

It would be gratifying to think that all the talk and the publicity given to smoke abatement was having the desired effect, but figures issued by the Department of Scientific and Industrial Research do not show much improvement in this respect ; in fact, certain towns are showing adverse pollution figures. Why should this be so ? Most people are in agreement that the use of raw coal is wasteful and dirty, but the number of them who continue to use it are in the majority. The difficulty appears to be that there are too many preachers of the doctrine and not enough people putting the theories into practice or taking action in the matter.

Though smoke and products of combustion are the principal causes of air pollution, a close examination will show that there are other sources which can be classified as follows :—

(*a*) *Industrial* :
  Smoke from boiler and process chimneys.
  Soot ash and gritty particles from combustion.
  Sulphur and other fumes from boiler and process furnaces.
  Fumes from chemical works and coke ovens.
  Grit and dust emitted by extractor fans from industrial processes.
  Smoke and fumes from burning tips and spoil banks.
  Smoke and fumes from the burning of trade refuse.

(*b*) *Domestic* :
  Smoke from domestic chimneys.
  Smoke and fumes from the burning of garden refuse.

(*c*) *Transport.*
  Fumes from road vehicles—petrol and heavy oil types.
  Smoke and grit from locomotives and steam wagons.
  Grit and dust from road surfaces and highways.

Mr. Law attempts only to deal with a few of these sources, and discusses the problems associated with collieries, burning tips and spoil banks, coke oven plants, metallurgical processes and road vehicles. As space does not permit the printing of the paper in full it will perhaps be of most interest to extract the sections dealing with collieries and vehicles.

Collieries

The fuel is raised to the surface, cleaned and graded. If the cleaning is a "dry process," there is the possibility of pollution at this source from the emission of dust. Part of the residual material is sent to the boiler-house, where it is used for steam raising, the remainder being deposited on the "spoil heap." The same thing applies if the fuel is washed ; certain washery settlings are sent to the boiler-house for fuel and the remainder are sent to the "spoil heap."

A colliery boiler-house is to all intents and purposes an "incinerator," where unmarketable fuels are disposed of. The fuels are probably low in calorific value and high in ash and moisture content. They vary considerably in size and composition, receiving many names, such as "batts," "belt pickings," "dry fines," "slurry," "washery settlings," etc.

Most collieries continue to use hand-fired Lancashire boilers with varied methods of forced draught to assist combustion and increase evaporation. Steam demands fluctuate heavily, and in many cases "forcing" of fires has to take place in order to maintain steam pressure, so that smoke nuisance is prevalent.

The Ministry of Health put forward a general recommendation that a uniform time standard of two minutes' smoke in thirty should be used, but it is difficult to imagine batteries of fourteen Lancashire boilers, served by one chimney, using inferior fuel, keeping to a standard such as this.

The problem is not an easy one to solve because of the variation in the grades of fuel that must be burned. "Time" is an essential factor in dealing with these fuels, and the boilers should be loaded only to the extent that the fuel has sufficient time to burn. Cleaning presents further difficulty, the high ash content making it necessary for fires to be cleaned every two hours, and unless there is some reserve of boiler power, steam pressure falls heavily during cleaning periods. Many methods have been tried in order to overcome these cleaning and burning difficulties—the use of retort or stepped fire-grates, the fitting of moving fire-bars in order to make the furnaces self-cleaning, and the use of preheated air to improve combustion. Mechanized methods have made rapid strides during recent years, both in the pit and on the surface, but in this respect boiler-houses appear to have been forgotten. Mechanized demands are calling for higher steam temperatures and pressures, so that a different method of disposing of these low-grade fuels is an important question. Sooner or later, the mining engineer will have to realize that water-tube boilers, fitted with chain grates or using pulverized fuel, will be the types of steam generators most suited for this work, and until these changes are brought about smoke nuisance at collieries will continue.

Road Vehicles

Every day sees the increase of motor vehicles, and with it an increase of pollution that has yet to be thoroughly investigated and controlled. Provisions for this control have been made with the Road Traffic Act, 1930—Statutory Rules and Orders, 1931—No. 4—Section 67 of which states :—

> "Every motor vehicle shall be maintained and used on a road that there shall not be emitted therefrom any smoke, visible vapour, sparks, grit, ashes, cinders or oily substance, the emission of which could be prevented by the taking of reasonable steps or the exercise of reasonable care, or the emission of which might cause damage to other persons or property, or endanger the safety of any other users of the road in consequence of any harmful content therein."

There is a maximum penalty of £20 for offenders.

In busy congested streets where a number of petrol or crude-oil-driven vehicles are running, it is quite common for the thoroughfare to be covered with a blue haze. In London, the traffic police have appointed motor and combustion specialists as police officers in order to investigate and control this kind of nuisance. There have been cases reported in the press where action has been taken. No heavy penalties have been imposed, but the magistrates have stated that penalties of a more substantial nature will be imposed in the future.

In the provinces, the traffic has not reached anything approaching the "saturation" point observed in the West of London, but it must be admitted that it is increasing daily. Certain fumes can be ascertained by the smell, but carbon-monoxide fumes cannot so easily be detected. There are instruments that will measure this form of air pollution, but they are not simple to operate, and some simple method of ascertaining the constituency of exhaust gases from road vehicles will have to be found if local authorities hope to control nuisances of this kind.

In conclusion, an appeal is made to all inspectors for local authorities to take a more active part in preventing the pollution of the atmosphere. It is essential that the area under control shall be inspected from time to time and nuisances reported, but it is amazing to find in the smaller industrial areas the amount of atmospheric pollution that is carried out daily without any apparent effort to control or reduce the same.

THE

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All bright and glittering in the smokeless air.

SMOKELESS AIR

The Smoke Abatement Journal

Wartime Issue No. 3 **Spring, 1940**
(Vol. XI., No. 41)

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COMMENTARY

Forward March Again

THE report on another page of the recent meeting of the Council records the important decision to " take every practicable step to maintain the work of the Society during the war period." This means that, as the Society has successfully adapted itself to wartime conditions, and is in a reasonably sound position, it is considered that our work should no longer be restricted, but should be extended as much as possible back towards its normal level. Although the Council left details to be considered by the Executive Committee, it is probable that what is done will be on the lines set forth by Dr. Jervis in the admirably written paper presented at the meeting. The first stage in the process is the return of the Secretary to full-time duties, a step that was becoming more and more desirable in view of the Society's increasing work.

A Word of Thanks

It is, of course, impossible to say how much we shall be able to do during the war: there are too many unknown quantities. But we could not even have attempted a step forward if subscriptions had fallen badly, and if there was little prospect of maintaining them in the future. Thanks are therefore due to our members, who have so loyally continued to give their support, even though they knew that for the time being our progress had been brought to a standstill.

The Barnacle of Smoke

As the nature of the national effort becomes clearer, and as the requirements of the new and more efficient economy under which we now must live are made more precise, all forms of waste and useless expenditure take on a new and more serious significance. An effective war effort—especially for what looks like being a grim and protracted economic struggle—must not be retarded by factors that have an effect similar to that of barnacles on the keel of a ship. They may be small in comparison with the ship itself, but their effects are extensive, and the faster the ship has to be driven the greater is the drag they create. Smoke is one of Britain's particular barnacles : a drag upon efficiency and economy from beginning to end. When the war broke out we thought that our work would have to be suspended until peace returned, but in a situation akin to seige, in which the economic rather than the military weapon may be decisive, the need for lessening the continuous wastage of which smoke is both an effect and a cause, becomes more urgent than ever. We do not think that we exaggerate the importance of this problem, and even though it would be easy to over-emphasise it, it is far easier to allow it to continue to be neglected.

* * * * *

The Lost Hundred Thousand

The implications of many consequences of atmospheric pollution are generally completely unrealised. For example, all who have studied the problem accept the estimate that each year it costs us in this country a sum in the order of £40,000,000. This includes the loss of fuel that is wasted as smoke and the loss borne by the community in checking and repairing the ravages of that smoke. It all goes back to human labour and human skill, and represents the year in, year out, work of at least 100,000 men and women. The work they do is necessary—under existing conditions. But it should not be necessary. It is essentially non-productive, and even considered as a service only it remains sheer waste. It diverts labour and skill from production, and creates a kind of reserved occupation that is outside the ken and control of the Minister of Labour.

* * * * *

Fuel and Food

The mal-utilisation of our coal reserves that is the cause of the smoke nuisance is referred to in our pamphlet " Smoke Abatement in Wartime," and we hope that the smoke problem will be duly taken into account by the new committees on fuel set up by the Secretary for Mines. The Ministry of Health has a growing appreciation of the problem, which should also be given the attention of the Ministries of Agriculture and Food. Food may win or lose the war and the importance of its home production is being stressed more and more. It is necessary that this should be done, but it is not realised how much more difficult and expensive is food production, because of smoke, in our industrial belts and in the neighbourhood of all large towns. The cost of fertilisers is increased, often considerably, and the quantity and quality of crops is adversely affected.

* * * * *

Vitamin D

Food is a means to an end: the health and well-being of the people. Clean air is also a means to the same end, and in at least one important aspect it affects the nutritional value of our food. The effective utilisation of calcium and phosphorus is accomplished through the action of vitamin D in the body. This vitamin is produced by the action of ultra-violet radiation, and is best and most cheaply obtained by the natural agency of sunlight. And yet we screen the people of our cities (where they need it most) from this essential radiation by means of heavy palls of smoke and dust which often cut off more than one-half of the light. The long, hard winter through which we have just passed, with its crop of deficiency disorders, has shown how important it is to utilise to the full what ultra-violet light is available. We enjoy little enough sun and light in the winter months, but with amazing profligacy we waste most of that. The effective nutritional value of our hard-won food supplies is diminished by an amount we can ill afford to lose.

* * * * *

And Yet . .

We believe that much more can and should be done during the war to promote smoke abatement. Not only for the reasons which have always made it important, not only for the better order we hope to see after the present struggle is over, but also because every improvement achieved to-day must directly or indirectly assist the nation's wartime economy. And yet the Society must hobble along, doing only a tithe of what it could do, because its funds are so limited and their future maintenance so unpredictable.

* * * * *

Postscript from Finland

In the section on smoke and air defence in "Smoke Abatement in Wartime" it was said that "Pall of smoke, forming clouds or 'smudges' of haze on the horizon would frequently make it easier for hostile aircraft to detect the presence of distant towns and industrial works, while the long plumes of smoke frequently seen, even in country districts, would quickly betray the presence of isolated factories and works that might otherwise have remained unnoticed." Striking confirmation of this argument comes from Finland where, as Edward Ward said in one of his last broadcasts from that country, fires would often not be lit until darkness fell, even in the intense cold of winter, for fear of the aid the smoke would give to raiding Russian planes. We have mentioned several Ministries in these notes, and would like to refer this paragraph to the Air Ministry.

An Active Wartime Policy

The Manchester Meeting

THE Society's first meeting since the outbreak of war was held in the Central Library, Manchester, on 2nd April. Although actually a meeting of the Council, invitations were extended to members, branch members, and the neighbouring Regional Committees, as the principal subject of discussion—smoke abatement during the war—was of interest to all. The attendance, about sixty, was higher than had been thought likely at the present time.

In the absence of the President, the Chair was taken by Mr. Charles Gandy, Chairman of the Executive Committee, who in opening the meeting, described the steps taken to safeguard the position of the Society as a result of the war, and the difficulties under which work had been conducted since then. The Secretary reported on present activities, the publication of *Smokeless Air*, and the general return of interest in smoke abatement now becoming apparent.

The Hon. Treasurer, Mr. Will Melland, in a financial statement, showed that income was being satisfactorily maintained, and that under present arrangements it was greater than expenditure. In spite of the reduction of activities, subscriptions received during the first nine months of the present financial year showed a decrease of only 17 per cent. of the amount received during the same period of the previous year.

The meeting then considered the principal items of the agenda, the question of general wartime policy. Dr. J. Johnstone Jervis, Medical Officer for Leeds, and Hon. Secretary of the West Riding of Yorkshire Regional Smoke Abatement Committee, had agreed to open the discussion, but as he was unable to be present, the paper he had prepared was read on his behalf. This was as follows.

Dr. Jervis's Paper

" War creates new problems and aggravates others. Among the latter is the abolition of smoke, which is the peculiar interest of this Society.

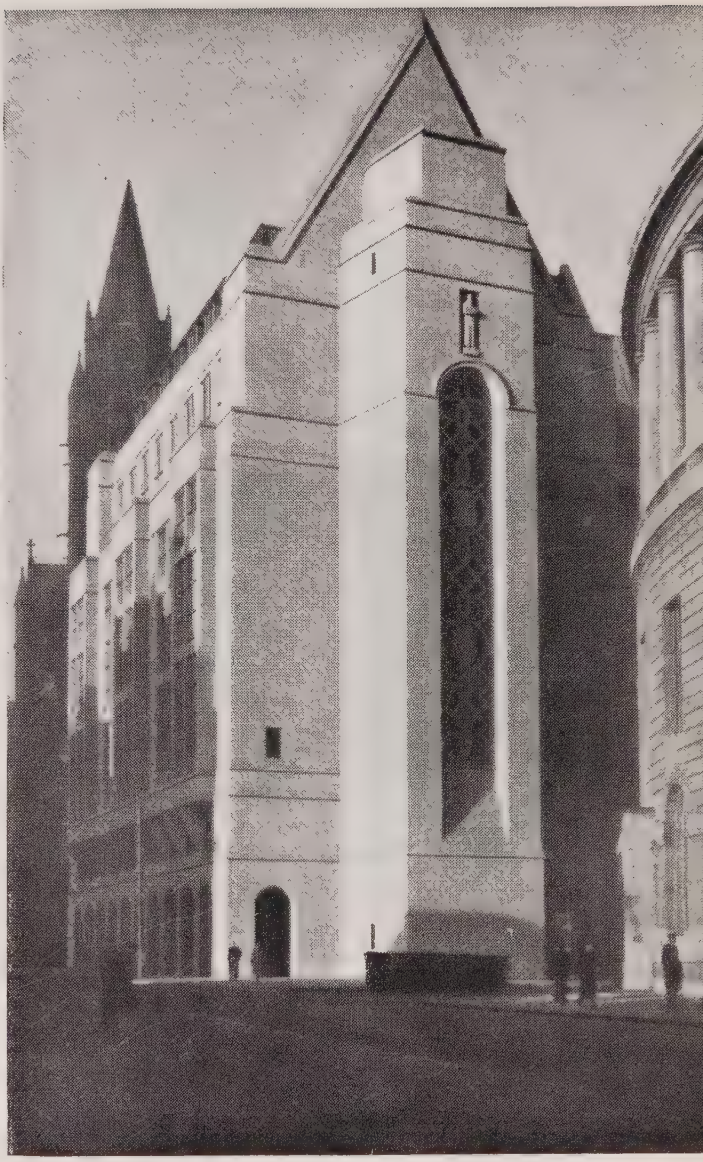
Since the outbreak of hostilities last September, the state of the atmosphere has deteriorated considerably, and there is evidence to show that the amount of soot and other suspended matter in it has increased. This is no more than one would expect, having regard to the enhanced activity in the realm of industry consequent upon the war.

Armaments, munitions and war material of all kinds required by the forces operating both at home and abroad are being turned out in increasing quantities, and this has meant the commissioning of new and the extension of existing factories, with the inevitable increase in the output of smoke.

In circumstances such as these one cannot expect the smoke byelaws to be observed with the same rigidity as in times of peace. From this it should not be inferred that there is any relaxation in the application of the smoke byelaws, but owing to shortage of staff and to other circumstances which I need not particularise, their application has become more difficult.

Another factor is the type of fuel which is being used. This is not always of the best quality, as very frequently the manufacturer has no choice but must accept the fuel he is offered, however indifferent the quality may be. Rushed work and faulty stoking also play a part.

During the hard weather in January, Leeds experienced one of the blackest fogs it has had for a long time (there were other fogs in November and December, but the one I refer to was particularly malignant). The effect was to send the death rate from respiratory diseases soaring to a high level. Perhaps I am wrong in laying the entire blame for this result on the fog. There may have been other causes, and I have to confess I have not had time to sift the evidence and obtain comparative figures for the corresponding period of other years. It may be merely an accident that the rise in the respiratory death rate coincided with a period of excessive atmospheric pollution, coupled with low temperature and absence of sunshine. But such as it is will be conceded that the evidence is at least suggestive.



A study of the new Town Hall (Central Library on right), Manchester, by G. Fishwick

Apart from the evidence of the mortal statistics, however, there seems little doubt that the war has aggravated the nuisance.

The Society's Policy

In such circumstances what action, if any, should the National Smoke Abatement Society take ? That is the question every member of the Society will or should be asking. There are three possible answers :

(1) having regard to the difficulties of the times, increasing cost of paper and materials, etc., and the likelihood of a fall in subscriptions, nothing : in other words, close the doors and conserve the Society's resources so that they will be intact and available at the end of the war ;

(2) continue the work but with a modified programme, cutting out all non-essential expenditure and confining our efforts to keeping the machine, so to speak, " ticking over," with an occasional " rev up " just to prove to the public that the Society is still alive ;

(3) carry on as if nothing had happened, indeed if possible with more intensity, particularly in the direction of industrial smoke, which is likely to get worse rather than better as the war proceeds.

Personally, I favour the bold policy of No. 3, and that for three reasons :

1. A war can be fought to a successful conclusion only if the nation's health is maintained. The effort required to achieve victory will call for every ounce of strength from workers as well as fighters, and to stand such a test of endurance every factor adversely affecting health and efficiency—of which smoke is certainly one—should be eliminated. Furthermore, when the war is over and the victory won, an A1 population will be needed to rebuild the new Britain and repair the breaches in our national life caused thereby.

2. Waste at the present moment, so we are told by our advisers, is not only a folly, but a crime ! That is a statement with which none of us will quarrel. There is no greater or more unjustifiable form of waste than smoke. It represents not only loss of fuel, which means loss of money, but also loss of economic security for the future as well as for the present. We may be entitled to squander our birthright—even that is questionable—but we have no right to squander the birthright of our children.

In the same connection there should also be a word of warning for the householder who weekly consigns to the dustbin a quantity of fuel in the shape of cinders, that if collected would keep one of our blast furnaces running for months. The people must be told that the nation simply cannot afford waste of this kind at such a time. Besides which, by burning cinders, which are a form of smokeless fuel, the amount of smoke from the domestic chimney can be considerably reduced.

3. Unless we are bold there is a risk of losing all that has been gained during these many years of hard work. If we are content to do nothing men will forget, byelaws will be ignored and become a mockery, cities and towns will once more become the abode of perpetual gloom, and so we might go on in the enumeration of the evils that will follow a do-nothing policy.

If ever there was a call to be up and doing, it is now, and as for the ways and means to prosecute the campaign, well we must just have faith. I cannot think—when our subscribers see that we are attempting something really worth while and making a valuable contribution to victory—that they will withdraw their support. On the contrary, when they hear our story and realise that we are in earnest about a matter which intimately concerns their own and the nation's welfare, they may be all the more ready to increase their support and perhaps even bring us new recruits.

" Waste," I suggest, should be the keynote of the Society's wartime propaganda. It will make a popular slogan and will appeal to all classes. The subject could be elaborated much more than I have been able to do in this short introductory paper. It can be dressed up and presented in many ways and yet always be effective.

There I must leave it, but with the firm conviction that the call of the present crisis is to greater, not less, activity ; to a broader, not a narrower, expansion of the principles for which the Society stands."

The Discussion

The views expressed by Dr. Jervis received, in one way and another, the support of all the subsequent speakers in the discussion, with the exception of Mr. R. H. Clayton, who said that so far as he was concerned, as a manufacturer, he would continue to produce his products and not pay the same attention to smoke reduction as he would do out of war time.

Councillor Asbury said that in Sheffield pollution had increased by 20 per cent. since the outbreak of war, and Dr. R. Veitch Clark said that in Manchester there was more black smoke and that the moderate smoke was denser. He agreed with Mr. Clayton that the present difficulties were real, but the solution was neither do nothing nor repression, and that a *via media* had to be found. The Society should examine the problems that had arisen and suggest means for improvement.

It was necessary to continue to give attention to public health questions, and, concluded Dr. Clark, " we must, in particular, make certain of the conditions for a thoroughly healthy childhood."

Mr. J. W. Beaumont said that the trouble was largely due, as always, to carelessness, and that there was no hardship caused in trying to prevent this. He declared that in Halifax also atmospheric pollution had increased since the war began.

A number of other speakers took part in the discussion and concurred with the general opinion that it was the Society's duty to embark upon a more active policy. Finally, the following resolution was adopted, *nem. con.* :

" That the Executive Committee be requested to take every practical step to maintain the work of the Society during the war period."

Who's Who in Smoke Abatement

Dr. J. S. Owens

DR. OWENS is a man of many parts and is difficult to sum up. He has a medical degree but is primarily a consulting engineer. He has been actively associated with the smoke abatement movement for many years and the present organised investigation into Atmospheric Pollution was initiated owing to a resolution proposed by him at a London Conference in 1912. He has made himself indispensable by the specialised attention he has given to the measurement and study of pollution. It would be impossible to describe all the contributions he has made to the scientific investigation of the problem or all the instruments he has devised for this purpose. The deposit gauge, the automatic filter, the jet dust counter, and instruments for estimating the density of smoke, are just a few of the entirely new types of apparatus he has evolved.

In 1906 Dr. Owens was doing the technical work involved in a series of tests on gas stoves being carried out by the Coal Smoke Abatement Society, and in 1910, with Dr. Des Voeux, he arranged and carried out the first sootfall measurements with the deposit gauge. Gauges were placed on sites (three in London and one at Sutton, Surrey), and the results were published in *The Lancet*. From this first experimental work has grown the present extensive Investigation of Atmospheric Pollution, under the Department of Scientific and Industrial Research, with Dr. Owens as Superintendent of Observations.

In 1922, he and Sir Napier Shaw published what has become a standard text-book, " The Smoke Problem of Great Cities," and in this as well as in many papers and articles he has created for himself a leading position in the investigation of the extent and precise nature of atmospheric pollution, and of allied problems such as that of fog.

Our knowledge of air pollution could not have been anywhere near its present stage if Dr. Owens had not given the question so much of his resourceful and inventive attention.

The Efficient Utilisation of Pool Oil

A Wartime Problem

BEFORE the outbreak of war, many oil-supplying companies sold Gas, Diesel, and Fuel oils under numerous different brand names. Under war conditions, however, in order to simplify the problems of purchase, sea transport, storage, and distribution, it became necessary in the national interest to reduce the number of separate grades imported and sold to the absolute minimum consistent with the reasonable requirements of the market. To achieve this object the British oil industry at the outbreak of war marshalled its resources in a Petroleum Pool and the business is now operated by the Petroleum Board. As a result of this co-operative effort it has been possible to meet the entire requirements of the U.K. inland trade with four broad standard qualities, viz. : Pool Gas oil, Pool Diesel oil, Pool Fuel oil, and Pool Heavy Fuel oil.

From reports and complaints received it is apparent that in many cases the use of the grades of oil available, presumably of different characteristics from that normally used in certain instances, has led to difficulties and to excessive smoke production. It is hoped later to publish further information on the particular problem of smoke prevention, but as this is one factor in the general question of efficient combustion, attention may be drawn to a paper presented to the Institute of Fuel on 25th January, on " Pool Grades of Gas, Diesel and Fuel Oils and Their Efficient Utilisation in Oil-Burning Installations," by N. L. Hudson, R. J. Bressey, and T. C. Bailey, of the Petroleum Board.

The authors state that " at the present time it is obviously of national importance, as well as of individual interest, to practise fuel economy in the broadest sense of the term. This can be done (1) by converting existing oil-burning plant to use a heavier and cheaper grade, and (2) by improving the efficiency of such plant." These two aspects are considered separately, but as the first section consists of detailed practical information it is impossible to make a useful abstract from it. Quotation may, however, be made from the section dealing with the improvement of the efficiency of existing plant. This is clearly necessary if, with the use of pool oil, smoke emission is experienced.

Excess Air

As in the case of other fuels, so also in the case of oil, excess air is a most common cause of fuel wastage. This occurs not only in boiler plants, but also in all types of industrial furnaces, where excess air may, in addition to wasting fuel, give rise to other serious disadvantages such as the scaling of metal, due to highly oxidising atmosphere in the furnace.

To discover the extent of the excess air, a flue-gas analysis should be made wherever possible, and steps then taken to ensure that all the air entering the boiler or furnace is under accurate control. The theoretical maximum CO_2 (with zero excess air) is 15.4 per cent., and it should be the aim of every fuel oil user to work as closely as possible to this ideal, unless, of course, the furnace conditions required justify a deliberate departure from it.

If the CO_2 determination shows that there is an undue excess of air, then a careful check by calculation should be made on the size of all orifices (including burners and secondary air ports) through which combustion air is admitted to the furnace.

The brickwork of every furnace and boiler setting should be frequently examined and all cracks and fissures made gas tight, to prevent the escape of hot gases or the ingress of cold air. Furnace doors should also be periodically inspected, to make sure that they have not warped, and that they fit closely to the surrounding brickwork, to ensure that no undue heat losses occur.

Preheating

While it is common practice in large steam boiler plants to recover, by means of economisers, a proportion of the heat carried away by flue gases, it is surprising how many industrial furnaces are in use where extremely high temperature gases are allowed to go to waste, without any attempt to recover the heat so lost. Many furnaces for such purposes as metal melting, forging, heat treatment, etc., readily lend themselves to the construction of a recuperator for preheating the combustion air. This may vary from a simple metal pipe recuperator, for small and intermittent furnaces, to an elaborate refractory recuperator or regenerator for larger furnaces which are in continuous operation.

In addition to the direct saving in fuel effected by the recovery of heat from the flue gases, preheated air also improves the efficiency of combustion, thus reducing the amount of excess air necessary.

Radiation losses are a serious item in the heat balance of most high-temperature furnaces, but these can be kept down to a minimum by the suitable use of insulation wherever possible.

A frequent sign of uneconomic conditions is the formation of carbon in combustion chambers. This is generally an indication that either the burner needs modification or adjustment or that the furnace brickwork needs redesigning to avoid impingement of the oil spray on the burner quarl or furnace walls. Carbon is an indication of wasted oil, leads to a shorter life of refractories, and upsets operating conditions in the furnace.

Many furnaces are extravagant in fuel because their users have demanded from the designer a unit which will cover a very wide range, either of temperature or output. It follows that if a furnace is efficient when dealing with the higher range it will be less efficient when dealing with the lower range. Many industrialists would be well advised to consider increasing the number of their furnaces in order that each one could be designed for as narrow a range of continuous operation as possible.

Sir Francis Goodenough

We regret that we have to record the death, on January 11th, of Sir Francis Goodenough, C.B.E., a man of exceptional brilliance, whose influence and work in the gas industry was great and far-reaching. Largely through him the industry became the first of the great utilities to develop public relations : supplying a service as well as a commodity. Sir Francis was among the first to recognise the worth and needs of the smoke abatement movement, and was among the Society's first and best friends in the world of commerce. He was, to the time of his death, an elected member of the Council.

He was for many years executive chairman of the British Commercial Gas Association. He served on many Government committees and the committees of trading organisations, and still found time to work for social and charitable movements. He was knighted in 1930.

Inspector Petty

Inspector Petty, who died suddenly on February 17th at an advanced age, was appointed Smoke Inspector for the Coal Smoke Abatement Society in 1899, and served the Society faithfully and well until his services had to be dispensed with in September, 1914, owing to lack of funds. He probably was the first whole-time smoke inspector in the country, and he laid the foundation for the methods which have been followed since.

Although the private servant of the Society, his services were constantly asked for by the Boroughs, not only in London but in the suburbs and fairly often in the country, and his evidence was always accepted as reliable by magistrates in the courts.

Not only was he a very faithful servant, but in his private life he was a fine type, and a good husband and delightful father. His wife, to whom he was devoted, and she to him, died some years ago, and he was never the same man again.—H. A. Des Voeux.

"SMOKE ABATEMENT IN WARTIME"

Some Press Reviews

The Society's recent pamphlet, "Smoke Abatement in Wartime," received an excellent press. It was reprinted in full by *The Medical Officer* and *The Gas World*, and extensively in *The Local Government Chronicle*. *Municipal Engineering* and *The Gas Journal* discussed it in lengthy editorial articles. Interesting comments and extracts from other reviews are as follows :—

> "It would be a matter of serious concern to the community if interest in the activities of the National Smoke Abatement Society were allowed to lapse under present conditions."—*Engineering.*
>
> "The National Smoke Abatement Society is carrying on its praiseworthy efforts to clean the polluted atmosphere of this country, in spite of the difficulties of the times."—*Electrician.*
>
> "One of the good causes which the heavy hand of war has thrust into the background is smoke abatement. In some quarters the tendency to let things (including smoke clouds) drift is reinforced by the argument that a smoke pall over a town is a useful disguise to be employed against enemy aircraft. A moment's thought would suggest that it must equally embarrass defending aircraft and ground defence."—*British Medical Journal.*

A National Defence Measure

> "Smoke results from the liberation of the volatile matter of coal, a large part of which is liquid. Smoke abatement is a movement for collecting this liquid for useful purposes instead of dispersing it as a public nuisance. Present conditions emphasize the wisdom of smoke abatement as a national defence measure."—*Nature.*
>
> "The Society has just issued a sound little booklet—brief, but very much to the point. . . . The abatement of the smoke nuisance should be persisted in. The movement had gained momentum. People were becoming smoke conscious——more conscious, perhaps, than the individual would readily admit."—*Gas Journal.*
>
> ". . . For such improvements as have taken place we must thank, above all, the National Smoke Abatement Society. . . . While rickets is an outstanding example of the result of smoke pollution, how much more ill-health—physical and mental—is chargeable to lack of the tonic and disinfectant properties of sunlight, is beyond an estimate. Psychologically, smoke and fog are pernicious. We are all creatures of the sun, and anything which cuts us off from the source of life impoverishes existence."—*Medical Press.*
>
> "It would be regrettable if the question of smoke abatement were to be lost sight of in the midst of the bigger burdens occasioned by the war."—*Municipal Journal.*

The expression of such views by the responsible technical and professional press is a valuable endorsement of the opinion of the Society's Council as shown at the recent meeting, and confirms the belief that it is both wise, from our own point of view, and desirable, from the national point of view, no longer to contract, but to extend our work during the war period. We clearly have a first-class case, and it is our responsibility to continue to put it forward as frequently and as effectively as we can.

THE TRIAIRE SOOT COLLECTOR

An Introductory Luncheon

REFERENCE was made in the last issue to the Triaire soot-collector being installed at Claridge's Hotel. This is now in operation and to introduce it a luncheon was held at the hotel, with Sir George Reeves-Smith, Vice-Chairman and Managing Director, the Savoy Hotel, Ltd., presiding. Lord Horder and the Right Hon. Herbert Morrison were present and spoke.

In referring to the need for smoke abatement Sir George made a statement that interestingly supplements Miss Fitzgerald's report on the cost of smoke to hotels (as recorded in the last issue). " Speaking as a hotel-keeper," said Sir George, " I should like to say that London is the most costly city in the world in which to keep hotels. It is necessary to repaint all the rooms once a year, and to renew the light window curtains five, six, or seven times a year, whilst in large cities in the South of France, Nice or Cannes for example, interior painting there takes place once in eight or ten years, not once a year, and the curtains last indefinitely from year to year and season to season."

Lord Horder

Lord Horder, supporting a move to help to decrease London's smoke, mentioned a frequent argument that is used in relation to smoke as well as needless noise—the argument that in time we grow accustomed to everything. " Yes," continued Lord Horder, " the human body, don't you know, and the human mind—even the human spirit—is very adaptable and very resilient ; it can put up with any number of these nuisances. My answer is ' Yes,' that is quite true. But why should we, faced as we are with burdens thrown upon our nervous systems and upon every one organ and tissue, in modern life—strains and stresses which we cannot avoid, which are at present an essential part of our very existence ; why should we ask our bodies, minds and spirits to put up with nuisances which can be avoided. That is my reply regarding the smoke nuisance of London and other great cities."

Mr. Morrison

" Nobody can have travelled among the continental cities, where conditions are better," said Mr. Morrison, and " compared them with London without feeling ashamed of the atmosphere of London for at least a large proportion of the year."

" If London could be freed of soot it would be a fine thing for us. It has all sorts of effects, one is that we paint our buildings with dull and rather dreary paints as a whole, whereas one would like to see those brighter colours—apart from the health point of view—and I would like to see a London of colour and brightness, rather than a town of drabness."

Mr. Morrison said that he was personally keen about smoke abatement and that as far as the London County Council was concerned, irrespective of party, anything they could do whilst carrying the public with them, would be done.

Le Capitaine Triaire, of Paris, was present to witness the introduction into this country of an appliance that won for him a competition organised by the municipality in Paris and which has since then been fixed on many important buildings in Paris, including the President's Palace.

The Soot-Collector

The soot-collector is a funnel-shaped apparatus made of sheet metal fixed on top of the chimney. According to the description circularised it separates the soot from the smoke coming up the shaft, and the soot falls into a box, only the clean, light smoke escaping into the atmosphere. The method of operation is as follows :

The smoke or like effluent, laden with soot or other impurities, travels upwards through the chimney and impinges on a deflector, which directs it downwards into a sleeve, the soot or other impurities separating out and falling into a hopper.

Ascending currents of air pass upwards under the first flange of the outer sleeve and flow outwardly between the upper flanges, causing an aspiration or a suction effect, whereby the smoke or gases, now free of the solid material and ascending from the sleeve, are entrained in the air and flow outwardly therewith between the upper flanges.

Descending currents of air pass downwardly through the cylindrical portion of the hood, then pass through narrow passages in the top of the hood and outwardly between the upper flanges, causing an aspiration or suction effect, thus entraining and discharging the smoke or gases between the upper flanges.

The soot or other impurities, which falls into the hopper, is blown by a downward current of air or gas into the soot box, the air or gas escaping through a vent in the soot box, the baffle fixed to the vent preventing the escape of soot.

The construction is such that no eddies can be caused within the interior of the apparatus by ascending or descending winds to interfere with the exit of the smoke or gases and the separation of the soot or other impurities, the separation taking place in a comparatively still atmosphere : the upper flanges prevent the entry of horizontal currents or winds.

The level of the aspiration deflector is adjustable, which enables it to be adapted for different draughts.

The wind direction does not have any effect on the appliance, which is said to work perfectly in all weathers, in contrast to soot-collectors previously tried and proved to be effective only under favourable conditions. Another advantage of the invention is that the draught is not decreased.

The smoke abatement interest being displayed in Paris is in consequence of the drastic " Loi Morizet," an account of which it is hoped to include in these pages in the near future.

THE COST OF SMOKE

Concluding Review of Miss Fitzgerald's Report

THE first part of this review of the investigation carried out by Miss Marion Fitzgerald immediately prior to the outbreak of war, which was published in the last issue, dealt with the results of inquiries directed to multiple shops, banks, and hotels. The remaining sections of the report are summarised below.

Property and Public Buildings

Estate agents when approached for information showed a great deal of sympathetic interest in the investigation and were well aware of the damage done by smoke. Although quite willing to help they were not able to supply statistical information about the greater cost of upkeep in smoky districts on account of the conditions of letting. Leases require that repainting shall be done at stated intervals whatever the atmospheric conditions.

This factor makes it difficult to arrive at any statistical comparisons between one district and another, for the effect is that the extent of redecorating, except at the stipulated intervals or between lettings, depends upon the standards of the tenants, and possibly upon their purses. The manager of one block of flats admitted that window sashes became very dirty within a year of painting (the custom is to renew exterior paint every three years) in the inner districts of London, but he added, " We don't trouble about dirty window sashes very much." This was another testimony to the regrettable fact that a polluted atmosphere tends to lower aesthetic standards, for nothing spoils the appearance of residential buildings more than grimy paint.

The supervisor of a large seven floor block of offices gave the information that the glazed terra-cotta face of the building was washed annually, partly for appearance and partly to prevent soot encrustations, at a cost of £20. " As regards the interior of this building," continues the report, " the supervisor finds that constant brushing of the staircase walls is necessary to prevent sooty deposit, drawn in from outside by movements of the lift, from adhering to the surfaces. Half an hour after washing the steps of the main staircase a thin film of sooty deposit can be detected by passing a finger or white cloth over them."

Further inquiries revealed the fact that the exterior of West-end buildings are cleaned much more frequently than those in the city. It was not the custom, Miss Fitzgerald was told, to wash the exteriors of blocks of city offices regularly, " though it might be done if some company renting offices in a block had a director who was ' fussy ' about cleanliness." One exception, the premises of a large foreign bank, had been recently steam-scrubbed, and so thick was the deposit of soot and dust that six or eight weeks were required for the job—an exceptionally long time for work of this description.

It was revealed that damage is caused to buildings in the city area by the large flocks of pigeons pecking at the mortar or cement, so that much re-pointing has to be done.

" We now come," concludes this section, " to the stupendous cost of a much-needed and long-deferred cleaning from facts supplied by the Town Clerk of a county borough in the industrial north. The town hall was opened in 1873, and in 1936, when considerable additions were made, the original structure was washed and cleaned. So far as can be ascertained it had not previously been cleaned. The bill amounted to no less than £3,830. This is a very large sum considering that the building is of comparatively modest size ; the town having a population of under 200,000. Knowing it well in the days when it was coal black, and having seen it after cleaning, I can testify that a very good job has been made of the washing process, and the old part of the Town Hall does not disgrace its new clean extension. But what a price to pay ! "

Libraries : Damage to Leather-bound Books

Evidence as to the damaging effects on leather of sulphur acids in the air was obtained from Mr. R. Faraday Innes, F.I.C., chief chemist of the British Leather Manufacturers' Research Association, who in addition to supplying printed matter on the subject exhibited a chart showing the varying degrees of deterioration of the book bindings in six great libraries. The extent of the decay corresponded with the amount of sulphur acid in the atmosphere, and also with the amount of outside air having access to the books in the stores.

Visits to several great libraries did not produce much statistical evidence of the cost imposed on libraries by a smoke-laden atmosphere, although all the officials interviewed had no doubt it was considerable. Factors leading to this lack of figures were that accounts for re-binding give no indication of re-binding due to wear and tear and due to decay, the variable quality of leather, and the effect of different modes of tanning. It is not considered that the physical effects of handling books are a conflicting factor. Reasonable handling of a leather-bound book does no harm. On the other hand, the bindings of thousands of books which are hardly ever handled are very subject to decay.

A long-period test now being carried out by the British Museum in conjunction with the National Library of Wales at Aberystwyth will when completed show the effects of atmospheric pollution on the various skins and methods of tanning used in book-binding. This test, which was begun in 1931, is a very thorough one. An equal number of books is being bound in each library, and in each case the leather is identical—one half of a skin going to the British Museum and the other half to Aberystwyth.

In twenty years' time some valuable facts as to the effects of pollution should emerge. The object of the test is to discover what skins and varieties of tanning will stand up best to atmospheric conditions.

Aberystwyth is taken as a town with clean air, and the books forming the subject of the test will be on open shelves as in the British Museum. Some 600 books in each library form the subject of the test.

Another aspect of the effect on books is in relation to the soiling of those from circulating libraries. The manager of a Twopenny Library with headquarters in London to which all books are recalled periodically, said emphatically that books returning from industrial towns were " markedly and consistently dirtier than those from other towns," but he was unable to estimate the wastage owing to dirty books being withdrawn from circulation.

Losses to Jewellers

A most interesting line of inquiry was that concerned with the damage done to the silverware which is stocked by jewellers, often in very large quantities. The extra cost due to a smoke polluted atmosphere is a matter of common knowledge in the trade. So great is the tarnishing effect of smoke on silver that chemists connected with the trade are constantly engaged in research to discover new means of preventing this tarnishing. The methods mostly in use is costly, adding about 10% to the selling price of the article.

All the jewellers interviewed were quite emphatic that the additional labour needed to keep silver bright in smoky districts was a definite loss to them. Specially trained people who can command good pay are employed week in and week out in polishing the goods. A certain amount of polishing would be necessary in the cleanest atmosphere, for new silver displayed for sale must be immaculate—the same does not apply to antiques, where a certain amount of tarnish seems to enhance the value.

" I was told," writes Miss Fitzgerald, " very definitely that the annual cost of the extra polishing needed in industrial towns if expressed as a percentage of the stock held would reach a surprisingly high figure. The Chairman of the National Association of Goldsmiths (Mr. Jack M. Ogden) who was much interested in the investigation, said that the loss incurred by jewellers through smoke-laden air had received a good deal of attention from his Association. He most kindly undertook to circulate a questionnaire throughout the membership of the Association with a view to getting as accurate an estimate as possible of the additional expense to which jewellers in smoky towns are put as a result of having to pay more to keep their stocks of silver bright. Some idea of the wastage of man-power in undoing the effects of smoke was also aimed at in the questionnaire"

This most valuable inquiry was started towards the end of July, but as it necessarily involved an immense amount of correspondence, the results have not been tabulated at the time the war began. The investigation has not been abandoned, only postponed, and it is hoped that after hostilities have ceased some very telling statistics will be forthcoming.

Another point mentioned by jewellers interviewed was that owing to the time and labour needed to keep silver free from tarnish people were inclined not to buy it in towns where atmospheric pollution was great, so there was a loss in selling as well as an additional expense for keeping stock in good order.

Summing Up

Miss Fitzgerald sums up the principal impressions she gained in the inquiry as follows :

(1) There is considerable loss to trading and other interests caused by smoke, and most of those who suffer are aware of the damage done, although, except in rare instances, they are not able at present to give statistical estimates in terms of money.

(2) The complicating factors caused by other sources of damage which resemble those of smoke are numerous, and often extremely difficult to disentangle.

(3) The effects of a smoke polluted atmosphere in lowering the aesthetic standard are undeniable.

(4) The courtesy shown by all, and the interest in the investigation shown by almost all those who were approached. The number of people who minimised the evils of smoke was negligible, while the number of busy men who spared time and took trouble to procure information, or to suggest lines of inquiry, was remarkable.

(5) The evidence accumulated in the course of a brief investigation justifies the conclusion that a large-scale inquiry if carried out over a sufficient length of time and conducted on scientific lines would be worth while.

In conclusion, Miss Fitzgerald is to be congratulated on the excellent results obtained in what was intended to be a preliminary survey only, and which was, unfortunately cut short when a few more weeks' work might have produced much more material. The scheme for the full-scale inquiry, which were being discussed, must of course be put into cold storage for the present : but when the time comes this report will be a valuable basis upon which to draw up the necessary plans.

SMOKE AND HEALTH

Resolutions of a U.S.A. Medical Society

ST. LOUIS, U.S.A., has a serious smoke problem which, from figures compiled by its Citizens' Smoke Abatement League, costs $19,147,000 a year. According to the Smoke Commissioner, R. R. Tucker, writing in " Smoke," the bulletin of the Smoke Prevention Association, the St. Louis Medical Society at a meeting last year adopted a series of resolutions on the subject.

The Ear, Nose and Throat Club, consisting of specialists in that field, passed the following resolution : " Smoke undeniably acts as a distinct irritant to the membranes of the nose, throat and lower air passages, thus creating a fertile field for the invasions of infecting organisms into these tissues, as well as aggravating whatever respiratory infection may exist in these areas."

The Trudeau Society, which consists of specialists in diseases of the lungs, resolved : " The Trudeau Society condemns the smoke situation in St. Louis because : (1) Smoke is a definite irritant to the upper respiratory tract. (2) Smoke produces an irritating cough. (3) It aggravates the cough of existing bronchopulmonary diseases."

The St. Louis Pediatrics Society, consisting of specialists in the diseases of children, passed a resolution declaring that : " In view of the fact that smoke so frequently pollutes the atmosphere in St. Louis and produces irritation of the respiratory tract and probably contributes to other serious disorders, we recommend that efforts be made to abate this nuisance."

The composite resolution of the St. Louis Medical Society furthermore declared that there were many scientific and numerous clinical facts which prove that smoke definitely impairs the health of the citizens.

Smokeless Zone Survey

Manchester's Interesting Statistics

THE smoke section of the City of Manchester Health Report for 1938 contains the result of a survey of the premises in the central area of the city which it was proposed to the Health Committee by a deputation from the Society, should be made smokeless. The area suggested is about 104 acres in extent and is the main commercial district.

The survey showed that the area contains 1,134 premises, with 4,505 chimneys or openings capable of emitting smoke.

A detailed analysis of the methods of heating—open fires, boiler plant, gas and electrical appliances, etc.—is given, and provides a complete picture of the fuel usage and present extent of smokeless conditions in the area. Indeed, in so far as the area is a representative sample of our commercial, as opposed to manufacturing and residential, districts, the information is of much wider value in that it indicates the sources of the smoke produced in these districts and where it is most necessary to stimulate further progress. Statistics of the type given have, as far as is known, not been obtained previously in this country.

Open Grates

To begin with, there are in the business premises in the area 3,901 open grates, of which 330 are not in use, 2,276 are of the modern barred type, 1,275 modern barless, and 350 are " other types." In these grates 155 tons of fuel are consumed each week, of which only 4 tons 8 cwts.—that is, 2.84 per cent.—is smokeless.

There are 98 stoves in these premises, of which 82 are smokeless and 16 not smokeless. Of miscellaneous appliances 61 are smokeless and only one is not smokeless.

Turning to boiler plant for central heating, steam supply, and hot water supply, it is found that 410 boilers are smokeless and 18 not smokeless. The weekly fuel consumption is 45 tons of bituminous coal, 228 tons of coke, 3 tons of anthracite, and 3,180 gallons of oil. Included in the smokeless category are those boilers using bituminous coal in mechanical underfeed stokers.

There are only 5 industrial steam-raising boilers in the area, of which 2 are smokeless and 3 not smokeless.

Cooking ranges and appliances are very largely smokeless largely because of the use of gas and electricity. 28 solid fuel ranges and appliances are smokeless and 71 are not, but contrasted with these figures are 1,453 gas fired and 269 electrically fired ranges and appliances.

There are almost equal numbers of gas and electric fires and heaters—2,556 and 2,257 respectively. Most of the gas fires replace open fires, but nearly one-half of the electric fires are in addition to open fires or central heating.

Dwelling Houses

There are only 6 premises used solely as dwelling houses, but the total number of premises with living accommodation is 72, with 189 chimneys. There are 140 open grates, 35 of which are not in use, in which are used weekly 3½ tons of bituminous coal and 1½ cwt. of semi-coke (in two grates). There are in addition 49 coal-fired kitchen ranges, consuming 4 tons of bituminous coal per week, and 52 gas appliances, 26 gas fires, 2 electric cookers, and 33 electric fires.

The survey concludes by stating that the statistics indicate that in the business premises within the area gas and electricity are utilised to a considerable extent for heating purposes, and in addition over half the solid fuel which is consumed is smokeless.

As such a large proportion of the heat and power used in the area is already produced by smokeless methods it would appear to be a practicable and economic proposition for those commercial concerns which continue to pollute the atmosphere by smoke, to follow the example of their more enlightened neighbours.

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Ships, towers, domes, theatres, and temples lie
Open unto the fields, and to the sky;
All bright and glittering in the smokeless air.

SMOKELESS AIR

The Smoke Abatement Journal

Wartime Issue No. 4 **Summer, 1940**
(Vol. XI., No. 42)

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COMMENTARY

Testing Time

THE profound changes that have taken place since our last issue, and the likelihood that another violent phase of the war will have begun before these pages are read, makes it difficult to keep a proper perspective in discussing matters that are not vitally concerned with the immediate struggle. It would, indeed, be easy to say that social and similar long-term problems are of no present importance and can therefore be neglected. It would, for instance, be easy to decide to suspend publication of this journal until quieter times, but a broader view shows that it is incumbent upon us to carry on. Smoke abatement is only one movement among many working for the betterment of conditions—health, housing, town-planning, amenities and the like—and we are thinking of all these when we say that it is now more important than ever to keep such movements intact and to prevent the start of that disintegration which would so easily and quickly follow paralysis. Such disintegration, under present strains and stresses, might be rapid and extensive, and would not only injure important elements in our social structure, but its acceptance would be akin to defeatism and could not fail to impair confidence and hope. Although the moment may call for little of the specialised work and accumulated experience of the many organisations of which this

Society is one, it must be remembered that if they were useful to the community in peace time they are useful to-day if only because they will be needed again as soon as the time comes to rebuild.

The Future

To talk of the time for rebuilding and to venture to consider the planning of reconstruction, may to some seem completely besides the point at this acutely difficult time. And yet it is a vast and most urgent problem, racing swiftly behind the problems of war, with which it always keeps pace. The more intense and destructive the war the graver are the problems that will follow, and the more necessary is it to consider them, in outline at least, before hostilities cease. If we must prepare for war in time of peace we must equally prepare for peace in time of war. With the demobilisation of the vast armies and vaster munitions industries will come sudden and acute problems of employment, rehabilitation, rebuilding and repair—not only of the direct ravages of war, but the ravages caused by the long and heavy strain upon industry and peoples. The problems to be faced will not wait for our convenience : unless they are quickly and adequately tackled when the time comes there will be dislocation and economic crisis of the first magnitude. Failure may mean disaster. The conditions under which all this will have to be done cannot be forecast, but it is certain that included in the reconstruction effort there will have to be vast schemes of public works and planned enterprise. Such projects, to be more than mere palliatives in a difficult transitional period, must be designed to help to create a materially better and more efficient order : they can provide an opportunity for much needed social and industrial planning, just as the Great Fire gave Wren an opportunity for planning a better London. The immediate need for this work to be outlined, and its paramount importance as soon as peace returns, are further reasons for keeping strong and active all those bodies which, like ourselves, exist to secure improvements in their own special spheres. In this post-war planning the prevention of atmospheric pollution by better means of utilising our fuel resources will enter into many possible projects and long-term policies, and the Society must be in a position to play its part in such vital work.

The Society's Finances

The financial year ended on 30th June, and when published the statement of accounts will show that our position is so far satisfactory. The reduction of income has been less than was thought likely, and less than the economies in expenditure that have been made. Reserves are therefore better than at the outbreak of war, but it must be recognised that there may be a more decided reduction of income as time goes on, and that after the war conditions may mean income remaining at a low level, coupled with an immediate need for vigorous activity and liberal expenditure. Thus we must try both to maintain income and to conserve our funds as much as possible.

WASTE ON THE FUEL FRONT

Better Furnace Efficiency is Equivalent to Increased Coal Production

FUEL economy has always been the keynote of smoke abatement work, for only by securing the complete combustion of coal can smoke, a product of incomplete combustion, be prevented. The Society's propaganda, the practical work of combustion engineers and of the Sanitary and Smoke Inspectors, and the instructional courses in boiler-house practice, have all been based on efficiency in the use of coal as the means for smoke abatement as well as being the way to secure a direct saving in the quantity of fuel consumed.

We are therefore on very familiar ground to-day, when the need is not for smoke abatement but, most urgently, for fuel economy for its own sake. The same principles for good combustion practice apply, and it is more important than ever that they should be widely understood and acted upon in every boiler installation, large or small. Abnormal difficulties exist to-day, and often there are over-riding problems of speed of production, but when such factors are duly reckoned with, every failure to observe the basic rules of good combustion practice means a direct waste of precious coal.

Mr. D. R. Grenfell, M.P., Secretary for Mines, in a recent broadcast, said that " we can all cut down consumption if we give attention to waste," and that " there is great scope for economy in industrial plants, and every user of coal must play his part."

There *is* great scope, and it seems hardly necessary to stress the fact that the prevention of waste is directly equivalent to increased production. Every pound of coal wasted is a waste of labour and transport, and lessens the amount available for more urgent use, for storage or for export. Every pound of coal saved relieves the great drive now being made for increased output and is a direct and valuable contribution to the war effort.

The Inspectors and all others who have been working on the practical side of smoke abatement can do much to assist the drive for fuel economy by continuing and even extending their advisory work among those who, in their own areas, they know can make a contribution. They have a special knowledge of the installations where savings in fuel can be effected with little or no difficulty, and where more attention is likely to be given now that the matter is one of national importance. Especially is there scope for such help among the smaller installations where rule-of-thumb methods, haphazard stoking and control, and a general ignorance of combustion principles, play an all too-important part. It is, indeed, perhaps more among the small users that substantial fuel savings can be achieved, for the larger installations are generally more efficiently run, and although the savings in each case may be small the aggregate of such savings must be very considerable.

The control of smoke emission for its own sake is at the present time a difficult matter. It is recognised that production requirements may in many cases make inevitable an increased amount of smoke. At the same time it remains as true as ever that a great deal of smoke is caused simply through carelessness or ignorance, and in such cases toleration is not aiding the production effort but is directly impeding it through the waste of the fuel involved. Smoke nuisances therefore should continue to be investigated and to be dealt with according to the circumstances of each case. It would be folly to disregard smoke at a time when fuel is so precious.

The Report of the Royal Commission on the Coal Industry (1925), referring to the Report of the Ministry of Health's Committee on Smoke and Noxious Vapours Abatement, says :

> " We would observe that the three million tons of soot which it is estimated by the Committee are discharged into the air annually, are equal in weight to nearly three days' output of all the collieries of Great Britain. In effect, the work of over a million men for three days every year is devoted to providing the soot which pollutes our atmosphere."

Believing that its experience and contacts can be usefully employed in this problem, the Society has drafted a short pamphlet on " Saving Fuel in the Boilerhouse," which it is intended to publish for distribution, as far as possible through Public Health Departments, when conditions seem opportune. It is on the lines of previous publications, but differs in that the emphasis throughout is laid upon fuel economy for its own sake and not as a means to other ends.

Recognising also present difficulties, the emphasis has been further laid on those factors that can be dealt with without expense or difficulty in any boiler-house. These include the need for regularity in the rate of firing, the importance of draught control, the maintenance of a high furnace temperature, the avoidance of unnecessary raking and poking, the value of means for chimney observation, co-operation between steam raising and using departments, and the maintenance of the plant in good condition.

The questions of adequate boiler plant, suitable fuel, feed water, and boiler performance records, etc., are mentioned as further, if not always immediately possible, questions to be considered. Finally, the important sources of fuel loss are summarised—in ashes and clinker, in smoke and unburned gases, and through unnecessarily high excess air.

With attention paid to these factors, and with the sustained exercise of care and understanding, many, perhaps the majority, of those in control of boiler plant could help themselves and the nation by a saving of fuel that would in the aggregate be very substantial. An average saving of 5 per cent. among all fuel users would liberate 7½ million tons of coal a year, and could in numerous cases be achieved with little more than knowledge and determination.

Investigation of Atmospheric Pollution

Representatives of local authorities and other bodies co-operating in the investigation of atmospheric pollution met, by courtesy of the London County Council, in conference at the County Hall on 28th May. Among others, representatives of Cardiff, Dagenham, Glasgow, London County, Halifax, Manchester, Newcastle, Salford, Sheffield, Rotherham, Westminster, the British Commercial Gas Association and Cadbury Brothers, were present.

The Conference, in considering its annual report to the co-operating bodies, unanimously agreed that while contribution to the war effort was the first duty and desire of every organization, the need for vigilant attention to the purity of the atmosphere had by no means decreased since the outbreak of the war. The wasteful burning of fuel, and the detriment which pollution caused to the nation's health were stressed as two aspects of the problem which must not be forgotten, particularly in wartime. The Conference therefore urged all local authorities to do whatever lay in their power to maintain the Investigation.

At the close of the meeting, Professor W. H. Roberts, M.Sc., F.I.C., of Liverpool, was unanimously elected Chairman of the Conference, in succession to Alderman Adams, M.P., of Newcastle, who had held the office for three years in succession.

"Stoker Etiquette"

We have received a booklet of this title from the progressive Fuel Engineering Division of Appalachian Coals, Inc., which in attractive fashion tells the domestic user of the underfeed stoker how to obtain the best results with the use of high volatile coals specially selected and sized for such use. Central heating in the home is of course general in the U.S.A., and the publication will help to make it efficient and smokeless. It is an excellent example of how practical help in combustion problems can be given interestingly and simply.

AIR POLLUTION AND DISEASE

From a Paper read at the 1939 Convention of the Smoke Prevention Association of the U S.A.

By John P. Koehler, M.D.,
Commissioner of Health, Milwaukee

IF pure air is essential to good health and polluted air is conducive to respiratory diseases through the irritation of the mucous membrane and responsible directly or indirectly for many other ailments, it is difficult to understand why so little progress has been made in most cities against disease-producing air. The results are even more discouraging when we consider that through the passage of proper laws and the installation of modern scientific heating and ventilating equipment, it would be possible to eliminate from our cities one of our greatest health and economic liabilities.

At this point the question might well be asked, why is it that communities, otherwise sanitary, continue to tolerate air pollution? Why are cities willing to spend millions of dollars for sewage disposal and water purification and not even hundreds of dollars for smoke disposal and air purification? No civilised community expects the citizens to drink bad-smelling, dirty and unsafe water, but few communities worry much about bad-smelling, dirty and unsafe air.

This inconsistent attitude is even more difficult to explain when one considers that unsafe drinking water, through personal effort, may be avoided, but polluted air cannot be escaped even for a moment by anyone surrounded by the same. While it is true that more and more people are forsaking the air-polluted cities for the country, we know that even such people cannot completely isolate themselves from smoke infested communities.

But even granting that a very large percentage of urban citizens can escape city health hazards by becoming ruralists or suburbanites, there is no city that can afford to neglect the health of the workers that are compelled to live near their places of employment, and continue to breathe the unhealthful air. The time has also arrived when city real estate owners must meet the competition of rural areas for the health and happiness of a progressive and independent citizenry, or see their property gradually depreciate from an asset into a liability. All of us, including health officers, private physicians and engineers, have been inclined to underestimate the value of pure air as a promoter of good health. As a result of this under-valuation, we have been reluctant to fight for better air as we have for a better drinking water and other community health essentials.

Water-Borne and Air-Borne Ailments

We also know that it is somewhat easier to dramatise water-borne diseases than air-borne ailments. One reason for this is that many times it is possible to trace the source of typhoid fever, amoebic dysentery and other serious ailments, to the water supply. And since even the most frugal citizens and public officials do not want anyone to contract typhoid fever from a community's water supply, it has been possible to obtain public moral and financial support for the elimination of water-borne diseases, regardless of the cost.

The time has come when those of us who believe that air pollution is responsible for a great economic as well as a serious health loss, must furnish reliable, intelligent and militant leadership for the eradication of this black blight. The old argument that it is better to permit the smoke stacks of factories to belch out dangerous smoke than to have such factories closed, is no more logical than to state that factories must be permitted to discharge their waste and sewage into a community water supply, because such factories give employment. We have never hesitated to order homes, apartments, business and industry to make proper provision for their sewage disposal, regardless of the cost, but we are inclined to procrastinate when it comes to issuing orders against air polluters.

The fact that there are some influential citizens who ridicule the idea that polluted air is responsible for ill-health, also make anti-smoke campaigns more difficult. There are still people living who believe that if they can drink polluted water and breathe smoky air, without dying or getting sick, every other person should be just as lucky.

Ills from Air Pollution

Although, as I stated previously, it is not as easy to trace air-borne ailments to their source, as it is water-borne diseases, I still believe that we are justified in holding polluted air at least partly responsible for the following ills :

1. The inhalation of smoke and gases causes an irritation to the mucous membrane of the nose, throat and lungs, thereby causing a congestion, which interferes with the normal protective secretion of the mucous membrane, and in that way makes the congested part very susceptible to infection.

We know that tuberculosis and pneumonia death rates are higher in the cities than in the rural areas, which should make all of us look upon city air with suspicion. The tendency has been to blame poor housing and crowded living conditions for a city's high respiratory death rates, when as a matter of fact living conditions in many rural homes are anything but sanitary and hygienic.

It appears to me that the important difference between urban and rural environment is not in the air within the houses, but rather in the air outside. When city residents, with more rest and recreation, better medical, hospital and public health facilities than is available to the rural population, suffer more from diseases related to respiratory irritation than do rural people, it is time for us to ask : " What have the farmers got that we haven't got ? "

2. Irritation from smoke laden air is not only responsible for respiratory infections, but also for one of our most common ailments, sinus infection. It is obvious that congestion produced by irritation in the nose and throat will not only lower the resistance against infection, but will also interfere mechanically with proper drainage of the orifices opening into the mouth, nose and throat.

Sufferers with chronic sinus infections are many times advised by their physicians to change climate ; perhaps changing from a heavily polluted city air to clean, unadulterated country air would also bring some benefit.

3. We are learning more each day about allergy. We know that certain types of air pollution may sensitise the individual and produce allergic manifestations. I believe that I am safe in saying that asthma has a higher incidence rate in the cities than it has in rural areas.

4. A smoky atmosphere not only irritates the sensitive membranes of the eye, causing a conjunctivitis, but also interferes with proper daylight illumination, which may be responsible for eyestrain.

5. One of the greatest, if not the greatest health hazard of smoke, is its interference with the proper distribution of the available ultra-violet rays of the sun. It is also unfortunate that during the fall and winter months, when the ultra-violet rays of the sun are at their lowest intensity, the smoke is at its greatest density. Vitamin D, which is produced by the action of the ultra-violet rays on the surface of the body, is essential to good health. When the heavy winter clothing and smoke prevent the weak violet rays from reaching our bodies, we will either have to obtain our vitamin D in some other manner, or jeopardise our health. But the ultra-violet rays of the sun not only help raise our resistance against disease, but actually destroy disease by killing the infectious material in the air. It has been demonstrated by reliable authorities that contaminated rooms in hospitals and other places can be practically sterilised with ultra-violet ray lights.

If dangerous bacteria and viruses circulate in the air indoors, there is every reason for believing that such infectious material also finds its way into the outside air. When the ultra-violet rays of the sun are absent or at a low intensity, the infectious material in the outside air may remain virulent for some time. Perhaps it is for this reason that we have our regular epidemics of colds, influenza, scarlet fever and other contagious diseases during the months of the year when the ultra-violet rays of the sun are at a minimum.

It is also possible that the increase of contagious diseases during long periods of cloudy weather, may also be due to an ultra-violet ray deficiency. Scarlet fever has always been considered a cold weather disease. It is rare in tropical climates and during the summer months of temperate zones. Perhaps it is the ultra-violet ray and not the warm weather that kills the scarlet fever hemolytic streptococcus.

There are other health hazards chargeable against air pollution, but I don't believe that it is necessary to mention any more in order to justify a more militant anti-smoke campaign.

REACTIVE GAS COKE BY ALKALI ACTIVATION

Production at Liverpool

IN a paper that would have been read at the postponed annual general meeting of the Institution of Gas Engineers, H. H. Thomas, B.Sc., M.Inst. Gas E., Chief Chemist of the Liverpool Gas Company, and P. J. Askey, B.A., of the Research Department of Imperial Industries (Alkali) Ltd., describe recent work on " The Production of Reactive Gas Coke by Alkali Activation."

Many readers will recall the paper on the production of " Dryco," read at the Society's Liverpool Conference in 1931, by the late Mr. R. E. Gibson, Chief Engineer of the Liverpool Gas Company, in which was described the production of a free-burning coke suitable for ordinary open fires, by blending coals and modifying carbonisation conditions. " Dryco " has been very popular, and about 17,000 tons a year are sold in the area. The present paper points out, however, that the gaseous thermal yield from the coals used is low, and while their use is financially profitable when the coke can be sold for its special qualities and at a higher price, it is not always possible to carbonise these coals accurately in accordance with the demand for " Dryco." During these periods, therefore, selected coals are being used while the coke returns only yard price and the gaseous thermal yield is reduced. The practice of maintaining a stock of the fuel has not been adopted and it has not been found possible to anticipate every variation in demand.

In view of these difficulties a process is sought which will enable this type of fuel—which does not need a special grate—to be produced from a greater range of gas coals, with no increase in gas prices.

The Process

The increase in reactivity obtained by the addition of alkali to solid fuels, state the authors, is a well-established phenomenon and there is a very considerable body of technical literature on the subject. The mechanism of the activation is still obscure, but the observed fact that the addition of small amounts of certain alkali metal salts increases the reactivity of solid fuels to oxygen, carbon dioxide and steam. In the case of carbonised fuels the alkali may be added to the coal before carbonising or to the coke after carbonising.

The operations were carried out on a works scale for 17 months at the Garston Gas Works, Liverpool. The method used was principally the addition of alkali to the coal before carbonisation, although mention is made of the direct application of the alkali to the coke.

The alkali used is sodium carbonate, but as this combines with clay constituents normally present in the coal ash, lime also is added as this will more readily react with these constituents and will so allow the use of a lesser quantity of the more expensive sodium carbonate.

The amount of lime required depends upon the nature and quantity of the ash (in this case about 1.25%) and the carbonate required is then about 0.5%. The paper gives details of the methods evolved for adding the mixture to the coal, ensuring a thorough mixing, and preventing any subsequent segregation.

The ash in the activated coke was increased by the added alkali from 6 to 8 per cent. on the average. The average ash content of " Dryco " is 6%, but the ash from the activated coke was denser, so that the volume of ash from a given weight of this coke was the same as for " Dryco."

The following table of grate tests compares the reactivity of the activated coke with " Dryco " and with a typical low temperature coke. (The " C.A.B." or Critical Air Blast, figures are a measure of the ignitability of the fuel under standard test conditions. The lower the figure the greater the ease of ignition).

Coke Sample	Volatile Matter, per cent	C.A.B.	Gas for Ignition cu. ft.	Time to Bright Fire, min.	Maximum Radiation, B.Th.U. per sq. ft. per hr.	
					1st period	2nd period
1	2	3	4	5	6	7
" Dryco " 1, Linacre	1.88	0.036	4	60	410	505
" Dryco " 2, Garston	3.17	—	4	70	385	495
Alkali activated coke, Garston	1.57	0.042	4	62	390	465
Low-temperature coke	7.4	0.028	4	66	387	420

The Sale of the Coke

During the period of the test approximately 6,000 tons of activated coke were produced and sold. It was delivered exclusively for considerable periods and at other times as a mixture with " Dryco " as circumstances required. During this time complaints which were received concerning the fuel were carefully analysed. They may be broadly divided into complaints of excessive ash and of poor reactivity. It was found that complaints due to ash were almost invariably caused by excessive amounts of shale in occasional deliveries of coal which had no connection with alkali activation. Complaints of low reactivity were, in the majority of cases, traced to badly graded deliveries—excess of small sizes gives easy ignition with dull and low rate of burning, while excess of large sizes gives difficult ignition and free burning with coke of the same quality. These variations in size have been traced to segregation in the coke bunker. Occasionally, and particularly in the early stages, complaints of inactive coke have been traced to insufficient wetting of the coal before adding the alkali, with the result that there has been some segregation of alkali. After the introduction of two-stage heating in the retort there was a definite improvement in the reactivity of the coke, which confirmed the generally accepted view that over-carbonising must be avoided.

Costs

A further section of the paper deals with the cost of gas production under " Dryco " and alkali activation conditions of carbonisation. The ultimate success of the process described depends upon the cost of gas production. It is shown that the lowest cost of gas production is obtained under alkali activation conditions, taking into account the necessary adjustments for increased breeze production under these and " Dryco " conditions, and also the additional costs of cutting and screening which are not incurred with the sale of forked coke. The costs are more than recovered in the greater revenue obtained from the coke.

" Some technicians," continue the authors, " have visualised the development of the domestic coke market to a greater extent than is required by local demands for gas. They suggest that coke sales should be increased to the point where the coal is carbonized primarily for the production of coke, and that the excess gas should be used for the heating of the retorts. This procedure will be necessary if, in the future, the burning of raw coal is to be greatly reduced. At present the carbonising industries are completely unable to supply smokeless fuel in the quantity or quality which such a demand would require. In the meantime every effort should be made to improve the quality of the coke, thereby increasing the demand and reducing gas production costs."

Activation after Carbonisation

Earlier attempts to activate coke after carbonisation by treatment with a treatment of sodium carbonate led to difficulties such as the control of the amount of alkali added and the formation of a white surface when coke dipped in a solution of carbonate is dried. Later work, which is not yet complete, showed that it was possible to spray the coke with the solution so that, with a fine spray, the solution is absorbed and the appearance of the coke practically unchanged. The most important factor appears to be that the coke surface must not be flooded so that a continuous film is formed over the external surface and a white coke produced. If the particles are sufficiently small and the rate of spraying not too great the coke will absorb the spray continuously and the amount remaining on the surface is only sufficient to cause a general lightening in the normal grey colour of the coke. Coke treated in this manner leaves no loose surface film which can be lost or can be a nuisance in subsequent handling.

The most satisfactory results have been obtained when the coke particles are moving in the spray mist, thus presenting continuously changing surfaces to the impingement of the spray.

It is appreciated that there is a great deal more work to be done before this method of applying alkali activation can be regarded as

(*Concluded at foot of page* 44)

Who's Who in Smoke Abatement

Will Melland

THE progress made by smoke abatement in Manchester in post-war years has been helped, to an extent that non-Mancunians would find difficult to appreciate, by the fact that Will Melland was the Chairman, first of the Smoke Abatement League, and then of the present Society. That he was also (and still is) Hon. Treasurer confirmed the fact, in the eyes of Manchester, that the Society was being run on sound and sensible lines.

Mr. Melland was, until a short time ago, an Alderman of the City Council, and is associated with many of the city's best and most effective movements. His first direct work for smoke abatement was when he became a member of the City Council's Atmospheric Pollution Advisory Board and Chairman of the Board's Statistical Sub-Committee. In this capacity he was largely responsible for the valuable report, " The Black Smoke Tax," which was published in 1920 and which surveyed the economic losses in Manchester due to smoke.

Later Mr. Melland became a member of the committee of the Smoke Abatement League of Great Britain, which had its headquarters in Manchester, and then was elected as Hon. Treasurer. Upon the retirement of John W. Graham from the chairmanship we note from the reports of the time that Mr. Melland was appointed " acting " chairman. The committee evidently ceased to look further afield, and before long the word " acting " was dropped.

Under his guidance and inspiration the League made real headway, and in 1929, when it united with the London Society, Mr. Melland was once more elected to the two offices. In 1934 he retired from the chairmanship, but fortunately continues to look after—and often to nurse—the Society's finances.

As Chairman during those early, and often rather critical, days, and as Hon. Treasurer throughout, he has been more intimately connected with organisation and development than anyone else, and it is to his wise and friendly guidance of things on the " office " side, as well as in matters of policy, that a great deal of the Society's progress is due. Indeed it can be said that without him at the helm it is unlikely that we should be anywhere near to where we are to-day.

AGRICULTURE AND SMOKE POLLUTION

By H. Trefor Jones,
Advisory Chemist, University of Leeds

(*From a Paper read at an Agricultural Conference in Belfast*, *July*, 1939)

THIS paper is a collection of observations made in the course of advisory work in Yorkshire during the last fifteen years on the effect of smoke fumes on the growth of crops and on the reaction of soils.

As Crowther and Ruston[1],[2] have pointed out, smoke adversely affects plant life in three ways :—

1. By absorbing solar energy ; in the worst cases as much as 40 per cent. may be absorbed.
2. By reducing the assimilatory power of the leaves, consequent upon the deposition of soot.
3. By the scorching effect on vegetation of the acids brought down by rain, and the indirect effect of these acids on plants by reducing the lime status of the soil.

Attention will be confined mainly to the last of these factors. One ton of coal contains between 15 and 30 lb. of sulphur, mainly in the form of pyrites ; on burning the coal the bulk of this sulphur is discharged into the atmosphere as SO_2 and SO_3, with about 5 per cent. H_2S. All these gases eventually reach the soil and become converted into sulphuric acid.

In a town the size of Leeds, domestic chimneys alone contribute about 150 tons of sulphur to the atmosphere every week, the equivalent of nearly a ton of sulphuric acid per acre per annum. Where the concentration of acids is of this order of magnitude it is not surprising that vegetation fails completely, and that metals, wood and stone corrode rapidly. In cities and towns the domestic chimney is the worst offender ; but in the less densely populated industrial districts in the West Riding, the bulk of the sulphurous fumes are contributed by industrial chimneys and by the smouldering pit heaps of collieries.

In the immediate vicinity of a burning pit heap—that is, for a distance of about fifty yards in the direction of the prevailing wind—every form of vegetation is killed, and visible damage to crops may be observed even as far as a mile away, although some fields nearer the heap may appear unaffected. Reverse slopes in undulating country are, more or less, protected from attack, and railway embankments and other features afford some protection to crops.

It is during the dormant months that most of the damage is done ; grassland and winter-sown crops like wheat and winter vegetables are the chief sufferers. Unless the concentration of smoke is very high, spring-sown crops survive fairly well ; it is, however, unsafe to dress potatoes with copper preparations even under conditions of mild pollution. Barley and sugar beet are rarely grown, but this is due partly to the unsuitability of the soil for these crops.

The symptoms of smoke damage on wheat are, first, the scorching of the tip of the leaf, followed by a yellowing of the remainder of the leaf, which later becomes reddish or purple in colour. The check which the crop thus receives results in uneven ripening, and a poor blackened sample of grain. Vegetables planted in early autumn may fail to survive the winter, and the survivors are of unprepossessing appearance.

The average grass field in the industrial parts of the West Riding is of very inferior quality. This condition is largely due to neglect, but neglect born of the unequal struggle between the farmer and the unnatural conditions. The predominant species are creeping Yorkshire fog, bent grass, and sheep's fescue. Cocksfoot, crested dog's tail, and meadow foxtail are found in most meadows, but they are stunted in growth. Perennial ryegrass and wild white clover are rarely seen. Wild red clover, however, seems able to withstand fairly severe conditions. The check that vegetation receives during the early spring seems to encourage the grasses to form seed very early in the summer, and most of the grasses are in full flower in the early part of May, that is, two months before haymaking time. The common weeds of grassland such as dandelion, knapweed, woodrush and sorrel, all develop a purple tinge in the leaves and in the stems of the flowers. Sheep's sorrel is the first plant to colonise a burned patch, and is followed by Yorkshire fog.

In temporary leys, the rye grasses and trefoil appear to be fairly resistant, but red clovers are very sensitive.

All trees in a smoke affected area are stunted in growth, and many branches are dead ; hedges are in a very poor condition and are kept in repair with a few strands of barbed wire, the maximum life of which is about four years. Creosoted wood forms the most permanent form of fencing.

Similar observations to the above, and many others, are made by Crowther and Steuart[3] in the Journal of Agricultural Science for 1914.

Even where the concentration of smoke is insufficient to cause visible damage to crops there must be a considerable adverse effect on the final yield. Thomas and Hill[4] have found that a concentration of 0.8 parts per million of sulphur dioxide produces no visible effect on the leaves of plants after an exposure of one hour, but reduces their photosynthetic activity by 44 per cent., and respiration by 38 per cent. These processes assume a normal rate soon after the treatment is discontinued. Exposure to a concentration of 5 parts per million of SO_2 for one hour causes a complete stoppage of photosynthesis and results in almost entire defoliation. The lower concentration of sulphur dioxide used in these experiments is of the same order of magnitude as that present in a smoke laden atmosphere. (McLachlan[5] reports that the maximum SO_2 content of London air in 1935 was 0.658 parts per million).

The Effect of Lime on Smoke-affected Areas

Adequate liming, although not imparting complete immunity, very greatly increases the resistance of crops to attacks by fumes. Crops growing on limestone and other alkaline soils are able to survive the less severe attacks. Liming effects a slow improvement on the acid grassland soils, but there is no doubt that the best method of improving such grasslands is to plough them out, apply lime and slag, and seed down to a good grass mixture.

Pastures alongside the River Aire, south of Leeds, are threatened by many active and potential sources of smoke ; a few of them suffer badly, but they seem to possess very strong recuperative powers, and recover rapidly once the smoke nuisance is abated. In one particular case it was reported that " even if the abnormal conditions cease, it will be necessary either to renovate this pasture with a seeds mixture or to run it through a rotation before sowing down to grass." Within six months the " abnormal conditions " had ceased, due to the closing down of the offending industrial plant. Without any treatment from the farmer the field recovered rapidly, so that in two years it was impossible to detect any signs of smoke damage. The lime requirement was unaltered and amounted to nearly three tons quicklime per acre.

The Effect of Acid Fumes on the Soil

Since most of the acid fumes in the atmosphere eventually reach the soil as oxides of sulphur or as sulphides, and become converted into sulphuric acid, it should be possible to measure the intensity of smoke attack by determining either of the following : (1) The increase in the H-ion concentration (or of the lime requirement of the soil) ; (2) The increase in the sulphate content of the soil.

The estimation of the sulphide content is not practicable, owing to the rapidity with which it becomes oxidised to sulphate. By means of the sodium azide[6] test, sulphides can easily be detected in all smoke affected soils, but this method is not capable of quantitative application.

1. *The determination of the reaction of the soil* for the purpose of measuring the extent of attack is only of limited use. The reaction of soils containing a reserve of calcium carbonate may remain constant for a number of years despite intense attacks ; soils at the other extreme, approaching a state of maximum acidity, also

maintain a fairly constant pH. under similar atmospheric conditions. Table I shows the relevant figures for two fields, both of which are subject to attack by smoke from smouldering pit heaps. Soil A is an arable soil derived from magnesian limestone ; Soil B is from a pasture on coal measures sandstone, and matted to a depth of two to three inches. Both fields were sampled in 1936 and in 1938.

TABLE I

The Effect of Smoke Fumes on the Reaction and the Lime Content of— A an Alkaline Soil, B an Acid Soil

	*p*H		Lime Requirement (% $CaCO_3$)		Percentage Free $CaCO_3$	
	1936	1938	1936	1938	1936	1938
Field A (6″ sample) ...	> 7.5	> 7.5	0	0	2.10%	2.02%
Field B (3″ sample) ...	3.85	3.70	0.55%	0.56%	nil	nil

Such differences as are shown might be caused solely by sampling errors.

2. *The estimation of the sulphate soluble in water* is of much wider application ; it has to be borne in mind, however, that sulphates are fugitive constituents in soils, and that an acid atmosphere is by no means the only source of sulphate to soils. Nevertheless, this method has proved very useful in confirming or disproving cases of alleged smoke damage, and in explaining differences in productivity of the various parts of affected fields.

The details of the method are as follows : 20 grammes soil are treated in a beaker with about 100 ml. hot water and stirred for five minutes. The contents of the beaker are filtered into a 500 ml. flask, the soil being transferred quantitatively into the filter paper. Hot water is added until nearly 500 ml. are collected, the contents being adjusted to the mark after cooling. Sulphate is determined in aliquots as $BaSO_4$.

The hot water extract is often brown and turbid, but aliquots can easily be clarified by the addition of a few drops of HCl and re-boiling.

The normal sulphate content of pasture soils unaffected by smoke is of the order of 0.015 per cent. (observed extremes=0.007 per cent. and 0.025 per cent.). The average in normal arable soils appears to be slightly higher, that is, about 0.020 per cent. The application of farmyard manure and sulphate fertilisers may add a further amount of about 0.015 per cent. total sulphates.

It is, therefore, fairly safe to assume that sulphate figures in excess of 0.020 per cent. for grassland and 0.030 per cent. for arable land indicate smoke pollution. It is also permissible to assume that where figures less than these maxima are obtained, any pronounced differences between the figures from fields manured alike are attributable to smoke.

The protection afforded to crops by various features is illustrated in Table II.

TABLE II

The Effect of " Protection " on the Amount of Water Soluble Sulphates in Soils

Soil	Form of Protection	Water-soluble sulphates (SO_4) Protected Soil per cent.	Exposed Soil per cent.
No. 1 (Pasture)	Rail Embankment ...	0.016	0.021
No. 2 (Pasture)	River bank	0.020	0.038
No. 3 (Arable)	Thick hedge	0.013	0.027
No. 4 (Arable)	Ridge	0.008	0.025

Crowther and Steuart[7] have found that on the north-eastern side of Leeds the amount of solid particles deposited on the ground decreases rapidly from the centre to the outskirts. A similar decrease is found also in the sulphate content as shown in Table III ; the samples of soil were all taken on the same day (5/4/37) from grass areas near the Leeds-York Road, which lies approximately in the direction of the prevailing wind.

TABLE III

Sulphates in Grassland Soils North-East of Leeds

Samples	Sulphate (as SO_4) per cent.
No. 1 (0 miles)	0.220
No. 2 (2 miles)	0.184
No. 3 (3 miles)	0.065
No. 4 (4 miles)	0.051
No. 5 (7 miles)	0.037
No. 6 (10 miles)	0.022
No. 7 (19 miles)	0.020

Compensation for Damage to Crops

In any industrial area it is very difficult to attribute damage to crops to any particular source of smoke, but where a case is clear, compensation is obtainable without much difficulty. Compensation sometimes takes the form of an annual sum of money, or more frequently the annual supply of lime or fertilisers. A few isolated disputes are taken to litigation, which is always a costly procedure, and even though a farmer may win his case, he may easily be out of pocket.

Colliery companies are becoming increasingly important as farmers and landlords. They purchase farms affected by smoke or by subsidence and re-let them at greatly reduced rents, a condition of the lease being that no complaints for damage to crops can be entertained, whether these complaints are made against the landlord or against any other colliery. The tenants appear to be quite satisfied with the conditions of their tenancy, and there is ample evidence that the companies are excellent landlords.

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REACTIVE GAS COKE (*from page* 39)

completely established, and, in attempting to transfer it to full works scale there will undoubtedly be further difficulties to overcome. But it is felt that the advantages of an alternative method of applying alkali activation which avoids any possibility of damage to retort refractories, however slight, are sufficiently great to justify the presentation of these preliminary results for discussion.

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"THE OPERATION AND MAINTENANCE OF HAND FIRED CENTRAL HEATING BOILERS WITH SPECIAL REFERENCE TO PREVENTING FUEL WASTE"

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Open unto the fields, and to the sky;
All bright and glittering in the smokeless air.

SMOKELESS AIR

The Smoke Abatement Journal

Wartime Issue No. 5 **Autumn, 1940**
(Vol. XI., No. 43)

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"SMOKELESS AIR" is the official organ of the Society, but the views expressed in contributed articles are not necessarily endorsed by the Society. Abstraction and quotation of matter are permitted, except where stated, provided the usual acknowledgments are made.

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COMMENTARY

Arming for Peace

IN our last issue under the heading of " The Future " we wrote of the need for early attention being given to the vast problems of reconstruction that race swiftly behind the problems of war. Social and economic reconstruction was mainly in mind, but now we know that there will also have to be reconstruction in the literal, material sense of the word. Severe though material damage may be locally, it is nevertheless only a slight scarring on the face of Britain, and this part of the problem is not likely ever to become more than a small fraction of the whole. Yet the material devastation is already making us think more about the future, and it is a sign of our national resilience and fortitude that almost before the dust has settled over the bombed areas there should be talk of a better and more worthy rebuilding. One well-known journalist demands the setting up of a " Ministry of the Future " immediately. " Instead of allowing the flower of our young architects to waste their time in unsuitable war jobs, let us pull them together into our new Ministry ; give them maps and plans of our country and our cities ; and tell them to go ahead with blue prints for a healthier and better world. The Germans are destroying much in

London and in a score of cities that we ought long ago to have destroyed ourselves. Let us allow fresh imaginations to play with the idea of raising from the dust of war, towns and dwelling places of which we shall have no cause to be ashamed." It is folly to think that all this, and the planning of social and economic rehabilitation, can wait until after the war. We must arm for peace before peace comes, and not wait for the critical hour when the arms are needed. There must be clear and fresh thought, encyclopedic in its scope, and there must be the same courage to be drastic that we have shown during the past few months.

The Society's Duty

The Society must be prepared to give its active and continuous support to proposals and schemes for such planning, and to use its influence and resources in helping to translate them into reality. As the direction of our war life and organisation becomes more defined it can be seen that smoke abatement, in common with many allied movements, can do little to help the direct war effort. For these movements and sources of specialised knowledge and experience to become moribund would be fatal; for them to be utilising their experience in preparing for the future means not only its effective utilisation then, but its preservation and consolidation now. The problem of air pollution is, of course, only one item among many, and though it is essentially secondary to the major questions—health, housing, amenities, fuel utilisation, and so on—it is a factor that enters into many of them. The architects, scientists and economists have the big parts to play in the planning of the future, and it is our job to make sure that their plans take full account of the need to achieve a pure atmosphere. There is, of course, still some immediately useful work to be done, and new opportunities have a habit of suddenly presenting themselves even to-day, so it must not be thought that the Society might become entirely preoccupied with the post-war era. But our main responsibility does seem to be both to prepare for our own future and to assist in the broader developments that are now starting to take shape beneath the turmoils and anxieties of the moment.

The Battle of the Books

The Society can often perform useful services (and incidentally usefully show that it is alive and kicking) by not taking a narrow parochial view of its functions and concerning itself with nothing but what is strictly smoke abatement. One example is reported on another page—our co-operation, mainly through lecturing assistance, in the "Stop Fuel Waste" campaign. Another is the support that was given, with many other bodies and kindred associations, to the successful campaign for the exclusion of books from the Purchase Tax. The main reason which it was considered made it appropriate for us to give active help to this campaign was that the taxation of books would materially impede education and the dissemination of information. As an organisation dependent upon the printed word more than anything else for the presentation of its case, and helped by a growth of understanding of related questions again made possible by print, it was clear that such a tax upon knowledge might well harm the Society directly, and would certainly harm the social and scientific progress of which it is one component part. If the infliction of such harm had been necessary for helping to win the war it would have been a different matter, but the economics of the case showed that while the revenue from the tax would be negligible, the effect upon the book trade and its export market would be critical and injurious to the war effort. After considerable agitation and discussion, in which many famous voices were heard, a Chancellor of the Exchequer who could see no difference between books and boots, relented. The battle was won, and we hope that the victory will be permanent.

Pollution in Pittsburgh

During the last two years or so we have been receiving, batch by batch for loose-leaf filing, the reports and records of an intensive study and analysis of air pollution in Pittsburgh. The work has been carried out under the Works Progress Administration for the city's Department of Health, and its extent is shown by the 350 closely typed pages of the report. The mass of data is so weighty that a close and careful analysis will be required before the results can be summarised and any conclusions drawn. This is being done by specialists in Pittsburgh, and, it is stated, " it will take time." It is therefore preferable to wait until this work is available than to attempt any independent survey. The only conclusion so far drawn is that " it is clearly evident that the city's anti-smoke ordinance should be revised and made more stringent and more inclusive ; that enforcement of preventive or suppressive measures should have greater official aid." Deposits were collected at 100 stations in the city, and smoking chimneys were observed for density and duration of smoke, six hours daily, five days a week, by 52 observers, under 5 supervisors, covering all sections of the city. These two items of the work show the thoroughness with which it has been done.

Forthcoming Publications

The Society's annual report, for 1939-40, will be published shortly and will be sent to all members. Also in course of preparation is a new booklet on smoke and its effects upon health. This will take the place of " Smoke and Health," from a paper by Dr. J. S. Taylor, which after having been in use for a number of years is now completely out of print. The health aspects of our problem must be kept to the fore even to-day, and the new pamphlet may perhaps be looked upon as the first of the new and up-to-date series of publications that will be required for the vigorous prosecution of our campaign at the end of the war.

STOP FUEL WASTE!

The Domestic Fuel Economy Campaign

FUEL economy, like economy in the consumption of other commodities, is an essential part of the war effort. The question of fuel is in some respects more important and complex than is the case with most commodities, not only on account of the mines, but also because of the heavy demands the distribution of coal supplies makes upon transport services, especially during the winter months. The requirements of industry must be met without fail or delay, and at the same time the comfort and well-being of the public cannot be neglected or in any way left to chance. Readers will remember, and will doubtless have acted upon, the requests made by the Mines Department during the summer months to stock as much fuel as possible as reserves for the coming winter.

The response is understood to have been very satisfactory, and in addition dealers and others have built up their own reserves. But more has to be done. Not only may enemy action cause temporary dislocation of transport arrangements at any time, but an intensely cold period can be even more serious, and if in any district the two difficulties should come together there would be shortage coupled with heavy demand. It is therefore necessary not only to store fuel but to urge its economy and elimination of waste in use.

This is the purpose of the further campaign of the Mines Department and the Ministry of Information, which is being supported by the interested trade associations and other bodies. The bodies assisting include the Coal Utilisation Joint Council, the Joint Committee of Coke and Smokeless Fuel Trades, the British Coal Utilisation Research Association, the Coal Merchants' Federation, the Board of Education, and the National Smoke Abatement Society.

It may be asked why, and in what way, the Society should be assisting a campaign that has no direct connection with smoke abatement (other than the possible reduction in smoke resulting from burning coal more carefully). We can in fact help only to a limited degree, principally on the lecturing side of the campaign, but we are glad for the opportunity of

"Mr. Snowman"

co-operating in an important feature of the general war effort. The work will also be of permanent value as education for the more intelligent and efficient use of fuel, which must always be one of our objectives.

Of particular interest to the smoke abatement movement is the Joint Committee of Coke and Smokeless Fuel Trades mentioned above. This is a new Committee representing the National Federation of Gas Coke Associations, the British Hard Coke Association, and the South Wales Anthracite and Dry Coals Committee. Its formation is, from our point of view, a welcome and potentially valuable sign of that increased co-operation between different interests that is needed to promote the commercial side of smokeless fuel utilisation on a rational and systematic basis. We hope that this co-operation will be permanent and that it will develop not only now but during the important post-war period.

The campaign is concerned only with solid fuels, for the wartime problems of the gas and electricity interests are quite different. Although the reasons for the extended use of these mediums, and of the smokeless solid fuels, as so frequently stressed by the Society, remain as true to-day as ever, and in some ways are more important than before, the present situation makes it necessary to accept the use of bituminous coal in the majority of homes, and to do what is possible to lessen its wastage.

Lectures

Many members of the Society have frequently lectured on the smoke problem, and nearly fifty of them have volunteered to speak on how to " Stop Fuel Waste " at lectures arranged through the Ministry of Information organisation. The Society has also been able to put forward suggestions for organisations likely to welcome such lectures. Such lectures will tell why fuel should be used economically and how it can be saved in the home, and give practical hints and information on the running of open fires, domestic boilers, and stoves, and so on. The different types of fuel, their characteristics and functions, will be explained. " Speakers Notes " are to be issued for the guidance of lecturers.

Publications

Advertisements, posters, booklets, and leaflets are being used in the campaign. The Ministry of Information advertising people are to be congratulated on the happy choice of " Mr. Snowman " as a key figure for the posters and advertisements. It is a telling photograph, cleverly tempering the idea of cold with a friendly and persuasive geniality.

Small folders have been issued on (1) open fires, stoves and cookers ; (2) domestic hot water boilers ; (3) small steam-raising plant ; and (4) central heating boilers. These are being distributed through the fuel merchants to the consumers and will be found to be essentially practical and helpful in a non-technical way. Of more extensive scope are three " Technical Service " booklets issued by the

Joint Committee of Coke and Smokeless Fuel Trades, which are excellent productions of a more technical nature for the guidance of those assisting the individual consumer. Small steam-raising plant, central heating boilers, and domestic boilers are the three types of installation dealt with.

The Secretary for Mines, Mr. D. R. Grenfell, M.P., has written a personal message that appears on each of the campaign's publications. " It is in the National interest," he writes, " to do all we can to save fuel. Will you help by making sure that you are using your fuel as economically as possible and avoiding waste ? This pamphlet will help you to do your share."

It is good work. Let us hope it will continue long after its immediate urgent purpose has disappeared.

SMOKE AND FUEL LOSSES

How Much ?

IT is generally agreed that when smoke is emitted there are corresponding fuel losses, and that when the highest furnace efficiency is reached there can be only a negligible amount of smoke. Problems recently under discussion have led to a more or less contrary view being suggested : it being declared that smoke can be emitted without any appreciable loss of fuel (or of heat) and that there can be greater losses with a clear, smokeless chimney than with a smoking one.

The question is one of both immediate and permanent interest, and it will be worth while to examine it rather more fully. Visible smoke is, of course, composed of unburned particles of carbon and of tarry hydrocarbons, which have escaped combustion because of either lack of oxygen or lack of the requisite temperature in or about the combustion zone of the fire. As combustion has failed to take place there is clearly a loss of heat which would otherwise have been liberated, and thus smoke inevitably entails a loss of fuel. The question arises as to whether this loss is appreciable, and whether in preventing it there may not be more serious losses.

If, for example, the smoke is diluted with a high excess of air, the density of the emission may be reduced and the quantity of smoke in the chimney gases may appear to be far less than it really is. This practice has often been resorted to, but it must be condemned on the grounds that the actual quantity of smoke is not diminished, so that its nuisance potential remains unchanged, and that the cooling effect of the high excess of air must result in further unnecessary heat losses. It is obviously bad practice to try to attain a clear chimney by this means. The cooling effect of the air may, indeed, result in an actual increase of smoke, even though it remains diluted and less obvious.

While it is always necessary to admit air in excess of the theoretical amount required, the excess is controlled and limited under good working conditions. The minimum excess for perfect combustion cannot, therefore, be far from the point at which smoke formation tends to start, and in working it is inevitable that this point should sometimes be touched.

Combustion engineers and experienced boilermen frequently declare that they prefer a chimney emitting a thin smoke to a perfectly clear chimney. This can be accepted as legitimate and technically desirable provided that there is but little deviation from the smoke formation point, and that the smoke emitted remains only a light haze at the chimney top. Such smoke has negligible consequences and represents an equally negligible loss of fuel. It may be regarded as an indicator, and as such may serve a useful purpose.

Dense Black Smoke

The production of a thin light smoke at the beginning of the smoke formation phase is, however, a very different matter from the production of dense or black smoke. Here there is definitely a substantital loss of fuel and heat.

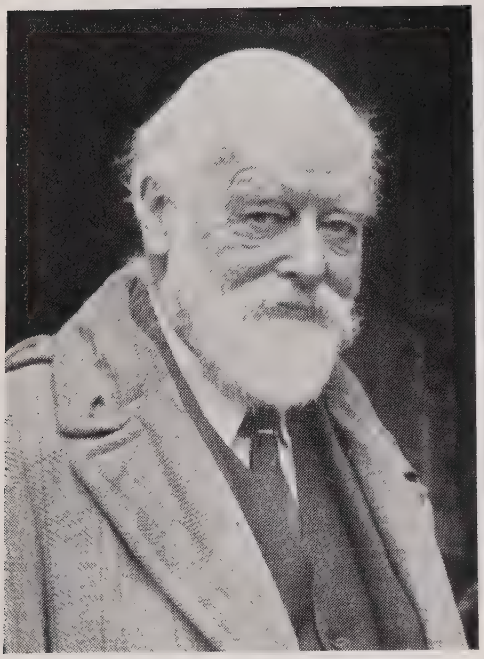
The loss of fuel is not as high as might be thought by the appearance of a chimney pouring out black smoke, and is estimated to be between 1 and 5 per cent. Bone and Himus in " Coal : Its Constitution and Uses," say : " We should be inclined to put it down at about 2 per cent. with hand-fired, and at 1 per cent. for mechanically stoked boilers, with, say, an all-round factory average of 1.25 per cent. So that on an assumed annual ' factory ' consumption of 100 million tons, the heat losses due to ' smoke,' apart from ' unburnt gases,' might be estimated as equivalent to 1.25 million tons of coal per annum."

These authors point out that " the direct heat loss occasioned by smoke, including that due to the unburnt gases associated with it, is usually not so considerable as is sometimes thought, and with good coals and careful firing need not exceed 5 per cent. ; but with soft coals and under bad conditions, it sometimes amounts to over 10 and sometimes as much as 20 per cent. of the total heat of combustion of the coal."

This stresses a point that is often apt to be overlooked—that though the loss represented by the smoke itself may not be high (although an aggregate loss of 1.25 million tons of coal a year is substantial) the other losses due to conditions of which smoke is only one symptom, may be more considerable. It is fallacious to regard the fuel lost in the form of smoke as the only, or indeed the principal loss : the conditions which give rise to that smoke are conditions inconsistent with general furnace efficiency.

Thus the statement that smoke need not entail appreciable fuel losses is true so far as the thin light smoke that accompanies good combustion is concerned, but is emphatically wrong if smoke is meant all and any smoke, including dense and black smoke. There the loss may be greater than is realised, and it is inconceivable that there can be conditions under which substantial smoke production can be permitted without equally substantial losses in the heat of combustion of the coal.

Sir Oliver Lodge



WE regret to have to record the death, at the age of eighty-nine, of one of the Society's most distinguished Vice-Presidents, Sir Oliver Lodge, F.R.S., D.Sc. Sir Oliver, whose scientific achievements were always associated with the widest interests in life and philosophy, had been connected with the smoke abatement movement for many years. On the practical side he made an invaluable contribution to air purification by the development of electrostatic methods for the precipitation of dust and grit—leading to the widely-used Lodge-Cottrell precipitator. Of considerable interest, too, were his experiments upon the dispersal of fog by electrical means.

Yet in a short notice of his passing, it may be most appropriate to reprint some extracts from an address in which is shown the philosopher's understanding of what lies behind the demand for pure air, and the scientist's impatience at the persistence of conditions under which such a problem could continue. In 1909 an important smoke abatement conference was organised in Sheffield (which led to the formation of the Smoke Abatement League of Great Britain), and in conjunction with this was held an Exhibition that was opened by Sir Oliver. Portions of his address were as follows :

" When we consider life as it is, and life as it might be, we are struck with the contrast. We are conscious of a feeling, not of despair, but of hope, for the future of the race. For so many people now are realising that life as it is is not as it ought to be, that all this squalor, this extreme of poverty, dirt, and smoke, and other things among which we are content—more or less content—to live, is not the intended and necessary condition of the planet, but the condition which we ourselves have brought about, and we ourselves could mend.

" The earth is beautiful in the extreme," continued Sir Oliver, amid applause, " in places where nobody lives ; but in places where people have decided that they wish to live in large numbers together for social purposes, for business purposes, for conveniences of all kinds, there they have made it ugly, there they have spoilt the face of the earth . . . to an artist the state of ugliness must be painful, and if it is not painful to others it is because they are to some extent losing their sensibility, which is a serious thing to lose."

(*Continued on page* 60)

ATMOSPHERIC POLLUTION, 1938-39

Publication of New Report

ALTHOUGH several months later than usual, it is gratifying that H.M. Stationery Office should have found it possible, amid its heavy wartime work, to have printed and published for the Department of Scientific and Industrial Research the 25th Annual Report on the Investigation of Atmospheric Pollution (2*s*. 6*d*. net). This report marks a quarter of a century's unbroken and steadily increasing activity, which, it is understood, is fortunately continuing, so far, with little interruption. The one change in the report is that for the first time the detailed deposit tables—last year printed as a supplementary volume—are not published. They may, however, be consulted on application to the Department.

The report covers the year to 31st March, 1939, and will thus be the last of the pre-war period. Subsequent reports will be of importance in revealing the consequences of the abnormal conditions now prevailing, and their comparison with the present report will be of considerable interest. The desirability of continuing the observations without a break will be apparent.

Deposit Observations

The deposit tables can best be summarised by giving, as before, the figures of the total deposit for each station, together with the percentage of this in relation to the station's five-year general average. These are given in Table I. It is, of course, impossible to make any precise comparisons of conditions in different districts from these deposit records, as so much depends upon the situation of each gauge. A striking example of this is shown by the extraordinarily high deposit recorded at Santon, Scunthorpe, which is of the order of 2,000 tons per square mile per annum. This gauge is situated 30 feet from a steelworks, with houses, a sewage disposal works, and coke ovens close by. Similarly, the high deposit at Greenhithe is probably due to the presence of cement works in the neighbourhood. Such figures reveal, however, the appalling conditions that are to be found at certain specific points.

The grouping of results from stations that have been in operation for a sufficiently long period shows that the gradual improvement noted in recent years was being maintained, and this is shown by the summary given in Table II. It will be seen that for total deposits there were increases in 13 per cent., and decreases in 67 per cent. of the stations. In this table " reduction " means a reduction for the station of 10 per cent. or more below the general average of that station for the previous five years ; " increase " similarly means an increase of more than 10 per cent. ; and " no change " includes those stations

TABLE I

	Total Solids	
	Mean Monthly Deposit (Tons/sq. mile)	*Percentage of General Average*
Birmingham :		
West Heath	17	156
Bourneville :		
Village	10	110
Works	13	113
Bradford :		
Central	22	70
North	17	144
Bristol :		
Waterworks	23	—
Zoological Gardens	10	—
Burnley :		
Bank Hall Hospital	26	121
Marsden Rd. San.	19	—
Town Hall	32	—
Cardiff	15	99
Coventry :		
Edgwick	19	—
Greyfriars Green	19	—
Whitley	12	—
Dagenham	21	—
Dewsbury :		
Municipal Buildings	23	—
Ravensthorpe	22	110
Whitley	13	124
Edinburgh :		
Astley Ainslie Inst.	11	—
Glencorse	7	—
Leith Links	14	94
St. Andrew's Square	21	—
Garston (Herts.)	9	75
Glasgow :		
Glasahoile	10	—
Glasgow Cross	23	90
Queen's Park	16	93
Ruchill Park	18	89
Victoria Park	15	56
Gloucester	11	71
Godalming	6	—
Greenhithe	52	—
Grimsby	16	—
Halifax :		
Akroyd Park	19	147
Belle Vue Park	16	122
Infirmary	14	126
Wade Street	30	124
West View Park	12	104
Hove	45	—
Huddersfield :		
Cooper Bridge	10	35
Deighton	22	65
Keighley :		
Morton Cemetery	11	—
Kingston-upon-Hull :		
Central	23	79
Country	9	—
Suburban	9	—
Leeds :		
Headingley	12	108
Hunslet	21	76
Park Square	31	111
Templenewsam	11	131
York Road	23	88
Leicester :		
Humberstone	11	87
Town Hall	23	79
Liverpool :		
Aigburth Vale	15	118
Cambridge Street	29	111
St. George's Hall	29	105
Loggerheads	5	—
London :		
Archbishop's Park	19	76
Battersea Park	18	—
Finsbury Park	17	78
Golden Lane	22	63
Horseferry Road	30	103
Kew Observatory, N.	9	93
Kew Observatory, S.	9	77
Mount Street	22	91
Ravenscourt Park	14	51
S. Kensington (M.O.)	20	96
Southwark Park	21	88
Victoria Park	17	97
Wandsw'th Common	12	76
Westminster—King Charles St.	21	91
Loughborough :		
No. 1 Gauge	10	41
No. 2 Gauge	9	—
Lymm	12	—
Manchester :		
Baguley	11	—
Booth Hall	15	—
Heaton Park	12	—
Philips Park	41	—
Rusholme	26	—
Withington	13	—
Marple	13	66
Margate	9	—
Marsden	17	—
Newcastle-upon-Tyne :		
Town Moor	13	62
Welbeck Res.	16	84
Westgate Cem.	17	52
Otley	18	—
Rothamsted	6	62
Rotherham :		
Oakwood Hall San.	15	121
Technical College	22	84
St. Helens	28	74
Salford :		
Drinkwater Park	21	132
Ladywell San.	21	87
Peel Park	20	63
Scunthorpe :		
Britannia Corner	23	—
Isolation Hospital	19	—
Santon	174	—
Sheffield :		
Attercliffe	31	123
Dore	8	—
Ewden Waterworks	10	—
Nether Green	9	98
Stocksbridge	19	100
Surrey Street	25	77
Shipley (Yorks.)	15	89
Skipton	15	—
Southampton	22	155
Southport :		
Bedford Rd. Park	16	151
Hesketh Park	10	88
Stoke-on-Trent :		
Leek Rd.	18	99
Longton	26	105
Tunstall	18	—
Wakefield :		
Clarence Park	9	79
Wallsend	13	82
Walsall	15	143
Widnes :		
Isolation Hospital	22	—
Moor Lane	43	—
Wolverhampton :		
Public Abbatoir	23	—
West Park	12	—

TABLE II

	Per Cent. of Stations Showing		
	Reduction	*Increase*	*No Change*
Insoluble Matter :—			
Tar	41	33	26
Carbonaceous other than tar	54	14	32
Ash	75	11	14
Soluble Matter :—			
Loss on ignition	61	29	10
Ash	68	7	25
Total solids	67	13	20
Included in soluble matter :—			
Sulphates (SO_3)	67	15	18
Chlorine (C.1)	22	48	30
Ammonia (NH_3)	74	15	11

whose deposits are between 90 and 100 per cent. of their general averages.

Suspended Impurity

The automatic filter, which measures the impurities floating in the air, requires more attention than does the deposit gauge, and only a few are in use. Reference must be made to the report for the interesting tables and graphs showing the hour-by-hour variations, but the average for the year, for the stations concerned, together with the percentage of " Z " days during the winter months, may be listed. A " Z " day is one of thick smoke haze, and is recorded as such when the suspended impurity exceeds a concentration of 1.28 milligram per cubic metre. The figures are as follows :—

	Suspended Impurity Average for Year (*mgm/m*^{3})	*Percentage of Z days during winter months*
South Kensington	0.21	9
Victoria St., S.W.1	—	34
Westminster Bridge	0.33	11
Cardiff	0.06	0
Coventry	0.25	1
Edinburgh	0.51	31
Greenwich	0.70	56
Kew Observatory	0.08	4
Kingston-upon-Hull	0.34	24
Stoke-on-Trent	0.59	45
Glasgow (average of 5 stations) ...	—	8

The absence of smoke haze at Cardiff, and its high incidence at Greenwich and Victoria Street, are customary. The remarkable difference between Greenwich and Kew is worthy of note. The ratios of winter to summer suspended impurity are given in the report, and whereas this varies from between 1.46 to 2.00 in all other cases, in Kew it is as high as 4.33. This is doubtless because Kew is the one predominantly residential area and therefore shows more clearly the effects of domestic smoke. Another table in the report summarises for comparison the figures for the present and the previous five years, and from this it is seen that the incidence of smoke fog on the first three days of the week is greater than on the others. The lowest incidence of smoke fog occurs on Sunday on the average and for five individual years out of six. Kew gives a low percentage for all days, but, again because it is a residential district, shows no week-end minimum.

Other tables given in the report relate to pollution due to sulphur dioxide, to the lime, alkalinity, and acidity of the air, and to the records of daylight and ultra-violet radiation measurement.

The intensive survey at Leicester is being continued for a further year (i.e., to the present year) as some aspects of the work were yielding results of special value. No report is yet made of the results of any of this work, but it may be assumed that, when published, it will be of considerable interest and will give important new information about the distribution of pollution.

Zinc Oxide

Reference is made to research into the control of zinc oxide fumes which occur during the manufacture of brass, which is being carried out by the British Non-Ferrous Metals Research Association with the co-operation and financial assistance of the Birmingham City Corporation. Also of interest is the statement that the Committee have examined a suggestion that a source of chimney grit might be identified if some of the fuel used in the furnace were to be treated with radioactive material. Experiments to test this have been carried out at the Fuel Research Station, and the results are awaited.

The report includes an illustrated communication by R. J. Schaffer, of the Building Research Station, on " Atmospheric Pollution in its Bearing on the Weathering of Stone and Similar Building Materials." This is an authoritative survey of the way in which buildings are discoloured and their surfaces subject to chemical decay by atmospheric deposits and acids, and will be more fully reviewed in a later issue.

SIR OLIVER LODGE—(*continued*)

Sir Oliver's address concluded as follows :

" There are a great many things that could be done to improve life, and the purification of the air is one of them. The atmosphere that we live in is not the atmosphere in which our history has been made, and our history now seems to be getting smoky and foggy. The issues do not seem quite so clear. Still the times are hopeful. People are realising that things are wrong, and that they have got to mend them. They realise that the earth has been handed over to them to a large extent for management, that things would not be done unless they do them, and that they are agents, that the duty and responsibility rests upon them, and that the powers above depend upon them to use their intelligence, with which they have grown by the process of evolution, for the benefit and material salvation of mankind."

Domestic Electricity in Wartime

Miss Caroline Haslett, C.B.E., Companion I.E.E.

From a painting by Dorothy Vicaji

The Work of the E.A.W.

By Caroline Haslett

THE ideals on which the Electrical Association for Women was founded 15 years ago are emphasised by to-day's wartime conditions. Health and cleanliness are of paramount importance, but the crowding occasioned by dislocated transport and the necessity of finding shelter from air raids has made it more difficult to maintain both health and cleanliness. A pure atmosphere, free from smoke and dust-laden germs, is an essential in maintaining the health of the nation, and it is the cleanliness of electricity in all its functions which emphasises its many advantages in wartime.

Cleaning and Cooking

Domestic electrical appliances are operated without raising dirt, dust or smoke. An electric vacuum cleaner enables cleaning to be done in the minimum time, while the dirt gathered up is disposed of in a clean and efficient way. Cooking by electricity is carried out easily and with a complete absence of fumes. Similarly, home laundry by means of an electric washer and wringer and an electric iron is an operation which occasions no undue effort and no dust or smoke.

Heating and Lighting

It is perhaps in heating and lighting that electricity's special property of cleanliness is abundantly evident, and is therefore especially appreciated in wartime when domestic help is difficult to obtain and household work must necessarily be reduced. During an air raid it is not essential to turn off the main switch, and heat and light are in consequence immediately available. The installation of an electric fire means that there is no question of a hearth which requires attention after use, nor is there any accumulation of soot in the chimney which the vibration of an explosion may cause to fall on to the drawing room carpet. The availability of a constant supply of hot water is an important matter, both for carrying out cleaning operations speedily, and also for first aid requirements. An electric water heater of the storage type enables hot water to be available for some considerable time if the supply happens to be temporarily disconnected.

Electricity is the simplest, cleanest and healthiest method of lighting, and the absence of smoke preserves the furnishings, fabrics and other fittings in the room. This is an important fact when expenditure in the home is reduced.

Portability

Both for lighting and heating the portability of electricity is an asset of special value in wartime. Light and warmth may be conveyed to any room which is suitably wired, without creating any additional work for the housewife. Lighting and heating the air raid shelter is a comparatively simple and absolutely clean matter when carried out electrically. Utility fires are available, tubular heating is both safe and economical, while in addition to a permanent lighting installation emergency lighting is obtained from a complete portable electric lighting unit, for which the battery can be charged as easily as that of a wireless.

Safety

The fact that electricity gives power, light and heat for domestic purposes in the safest possible way particularly commends its use in wartime. The current can be switched off in a second if necessary by the householder who, at the same time, is not always seriously inconvenienced by damage to the plant of the Electricity Undertaking, as it is so often possible for the Power Station engineer by a transfer of supply to restore an interrupted service in a very short time.

The E.A.W. was formed to spread the knowledge among women of electricity as the great labour-saver and executor of household tasks in the cleanest and quickest possible way. The growth of the Association to some 9,000 members in over 80 branches has indicated how women appreciate electrical housekeeping in peacetime. In wartime they are recognising more and more that the electrical method is the solution to many household problems which have been emphasised by wartime circumstances, and also to others which have been created by the new conditions. The housewife to-day is a woman of many parts, and while her household duties must take as little of her time and energy as possible, it is even more necessary that housekeeping and homemaking shall be efficient in view of disturbed nights, difficult transport and a general increase of discomfort. Moreover, many women have extended their activities beyond the duties of their own homes and in various ways take their part in civil defence and the amelioration of wartime hardships. Members of the Housewives' Service League know that electricity enables them to produce a hot drink easily and quickly, as well as meeting any other sudden requirements.

Electrically driven Welfare Canteen of the Electrical Association for Women. Originally intended as one of the fleet operating amongst H.M. Forces, but now lent to the London County Council for the time being for service in feeding homeless Londoners.

This picture shows the excellent design and equipment of the interior, including the Association's badge and the electric clock.

Communal Feeding

Emergency feeding for large numbers by means of stationary or mobile canteens is greatly facilitated by electricity. The cooking can be done in a compact space, and the electric wash boilers in which large quantities of soup and stew may be cooked, are easily transported to wherever distribution is to be made, while the contents still remain hot. Unavoidable delays in serving do not result in food electrically cooked becoming spoiled, as the warming plates will keep food hot without drying it up. In view of the impossibility of forecasting exactly where emergency feeding will be required from day to day, the mobility of electric cooking is an added advantage. The economies it effects in fuel and foodstuffs alone commend it as a wartime method. The special advantage of mobile electric canteens is the fact that, if air attack has made it difficult to cook food in a particular district, it can be cooked at a centre removed from the affected area. This obviates the necessity for keeping stocks of foodstuffs in specially vulnerable localities. An additional recommending factor is the rapid and smooth acceleration of electrically propelled vehicles, which are designed to operate for comparatively short distances, with frequent stops and, moreover, do not pollute the air with exhaust gases. The E.A.W. Mobile Welfare Canteen Service which is operating so successfully among isolated units of troops in different parts of the country immediately responded to the need for emergency feeding measures in parts of London.

Wartime conditions have reduced requirements to the absolutely essential—the provision of light, heat and food in the best way which, while according with the demands of health, shall involve as little trouble as possible. In meeting these basic requirements electricity is demonstrating its special suitability and adaptability, while making its great contribution to a cleaner atmosphere.

The Story of Coke

By W. Boon

Part of a paper entitled " Some Thoughts on Coke," recently read to the Institute of Fuel by Mr. W. Boon, General Manager of the London and Counties Coke Association. Extracts dealing with the quality of coke and its uses will appear in our next issue.

COKE in the form and character of its present-day production and the diverse uses to which we now apply it might be termed a new fuel and a new industry which has grown and developed largely within the last 25 years, and yet history vaguely suggests that coke was used as an article of commerce some 2,000 years ago by the Chinese, although there is nothing to verify this, and we get to the Middle Ages before we can discern the beginning of deliberate coke manufacture when it is clearly ascertained that Julius, Duke of Brunswick, recommended the coking of coal in 1584. English records have it that coke was made in the Middle Ages principally by blacksmiths for the working of iron ; they reduced coal so that it was brought to a resemblance of charcoal, which was the fuel used for metallurgical work at that time. The scarcity of wood for charcoal-making and the increasing demand for iron stimulated investigations for its substitution by coke. We have quite considerable evidence of the necessity to make this substitution, and it is on record that the Scottish Parliament in 1609 passed an Ordinance restraining the use of wood for iron smelting because timber was so largely needed for other purposes, primarily for the building of ships.

In 1620 the Patents Office records that Patent No. 15 was granted to one Hugh Grundie and others to correct the malignant qualities of coal by the special means to purge from it the sulphur and other contagious mixtures therein so that the fuel would be serviceable for the making of iron. So that, in effect, it was the need for iron which initiated the making of coke and brought the science of its manufacture to its modern stage. Although about the same period we have a further powerful influence bringing coke most prominently into the public eye, namely the brewing of beer. About 1640 coke was first applied to the drying of malt in Derby, and so important were the results that Derby malt and Derby beer became famous all over the country. Malt from Derby was regularly sent to London despite the difficulties of transport, and later records tell us that 200 loads of Derby malt were also taken to Lancashire and Cheshire each week. The fame of Derby malt led to the manufacture of " hearth " coke in other areas, and in 1663 Sir Robert Murray, describing this making of malt in Scotland, said : " They have a way of charring coal in all particulars the same as they do wood, whence the coal is freed from those noxious steams that would otherwise give the malt an ill odour."

The method of producing the coke in those days was probably developed by the charcoal burner, who set large coal in heaps and banked it with coal dust, a crude method of coke making which was continued probably for over 200 years, and Dud-Dudley, a man well known amongst the iron workers of those days, was popularly accredited with the greatest success in substituting coke for charcoal in iron smelting, although the credit for the successful use of coke for this purpose probably and more properly belongs to Abraham Darby, of Shropshire, whose successful application dates from about 1735.

The Blast Furnace

It was not until 1750, however, that the first coke blast furnace was built in Cumberland, by John Cookson, and by degrees others followed Cookson's lead, and, due to a rapidly increasing demand for iron, it is evident that the success of the coke blast furnace was fully established by 1790, by which time there were 81 in operation throughout the country.

What great changes have taken place in the coke-oven industry and the manufacture of coke since those days, yet, as I have already stated, the greatest development lies entirely within the last 25 years. Even 25 years ago mechanical handling of the coke after discharge was almost unknown, and it was lifted by hand into railway wagons. The construction of coke ovens at that time made it impossible to heat them uniformly, so that even 25 years ago the coke manufactured was uncertain in its composition and lacked uniformity of size and structure. The great mechanised plants with which we are familiar to-day had not begun to be built in this country until after the last war, so that the intervening years have seen the size of the by-product oven grow to its present dimensions. They have seen, too, mechanisation carried to such a degree that the number of men required to operate a battery has been reduced per ton of coke to a very small fraction of the number required in 1914. The heating of coke ovens has been improved out of all recognition, and scientific instruments have been applied to control its manufacture which 25 years ago had not even been envisaged.

There was then little realisation of the importance of the character of the coal that was to be carbonised, and it was the practice to put into the coke oven whatever rubbish the colliery had no other use for. To-day we recognise that the quality of coal is of fundamental importance, and that the characteristics of the coke and its value in use are profoundly affected by careful selection of the coals to be carbonised.

Blending

We have not yet progressed very far in the science of blending coals although blending is becoming common practice ; not only of blending of different coals, but of coal with coke breeze ; and more attention is being given to the preparation of these mixtures before carbonising so that coke of the correct quality and structure may be produced for the purpose for which it is to be used. There is a wide difference, for example, between the characteristics of coke required for the blast furnace and cokes produced specifically for domestic use.

In the old days coke was produced, and one used it as far as one was able to do so ; to-day it is manufactured for the purposes for which we specifically require it. There is no comparison therefore between the so-called cokes of 25 years ago and the exact fuel produced to specification which yet (and perhaps with some disadvantage) retains the name of *coke*. These remarks are true whether the coke comes from by-product ovens or from gas-making retorts ; and whilst great strides have been made in the improvement of coke quality, there is every indication that improvements in this direction will continue when peace-time conditions of coke production allow progress to be resumed.

In the last decade we have seen many significant changes in the coke-producing industries, one of the most outstanding perhaps being the convergence of development of the coke-oven industry and the gas industry. These two industries, producing about equal quantities of the total coke made, and now carbonising in the aggregate nearly 40 million tons of coal per annum, have come together in two major directions—first in the marketing and utilisation of their coke products, and secondly in the purchase and utilisation of coke-oven gas. Also the two industries have arranged common action in the marketing of benzol, sulphate of ammonia and tar, so that there is a close business alliance which did not exist, and had indeed no reason to exist, before the last war.

A New Movement

We have seen a further important movement in the coking industry which has a significant bearing on the production of coke for the general market. During the last ten years there has been a great reconstruction of the British iron and steel industry in which works have erected their own coke ovens and are utilising or are preparing to utilise blast-furnace gas, coke-oven gas, and even coke within their own works. The effect of this is to make the whole of the steel industry self-contained and independent of its requirements of blast-furnace coke which in earlier years it had purchased from the colliery coke ovens. This development has already assumed large proportions, and the day is probably not far distant when the great bulk of the coke requirements of the steel industry will be satisfied from its own coking plants. This development must be recognised as a process of rational integration providing for commercial and technical stability and for greater efficiency in steel production, but it will have the effect of directing colliery oven coke increasingly to other markets, to be used for purposes other than the manufacture of iron and steel. The purposes for which it may then be used embrace almost every type of heat application for which solid fuel can be utilised, so that coke production from the colliery coke ovens must develop exactly in the same markets and be used for the same general purposes as gas coke. This position is being wisely determined by the two industries who have recently set up joint associations, agreeing on marketing methods and co-ordinating development, so that instead of the old evils of competition between the two industries we can envisage progress on co-operative lines and under sane economic conditions.

It can be said, therefore, that the trend of development which has now been instituted by the coking industries appears to be on sound foundations, and if the progress which this unity of purpose promises is fulfilled, both commercially and technically, there would be no reason to doubt its future prosperity.

Conservation of our National Fuel Resources

Until quite recently the coal industry has not been interested in fuel conservation—in fact, it has perhaps felt aggrieved by the more effective methods of utilisation which have been devised and/or used by the consumers of its products. On the other hand, the coke associations, in the very foundation of their business, have had conservation as a part of their policy—in fact, if the more efficient utilisation of fuel is the major plank of their selling campaign then it must follow that it is supporting fuel conservation in its best sense.

Unfortunately, there has never been a National Policy of fuel conservation in this country, and the solid fuel industries have suffered because there has been no national guidance. If and when any National Policy might be formulated I think we shall see that its main plank will be " efficiency in utilisation " in the widest sense which can be applied to that term.

NEWS AND VIEWS

The "Fuel Economy Review"

The annual publication of the Federation of British Industries, the *Fuel Economy Review*, is, as usual, a most informative publication, covering the principal aspects of fuel utilisation in a series of articles by technical and scientific authorities. There is often an article on some aspect of the smoke problem, but on this occasion the subject is not directly dealt with. An article by A. Blackie on the control of small and medium sized boiler installations is a useful discussion on coal quality and sampling and on the measurements required to assess boiler performance. Several articles deal with gas, its development as an industrial fuel and for motor transport, and those interested in the industrial uses of electricity will find an article on electric power tariffs and agreements of value. A further article deals fully with methods and practice in the warming of industrial buildings. *The Review*, price 2s. 6d., may be obtained from the Federation at 21, Tothill Street, S.W.1.

Standards for Chimney Emissions

The emission of grit and dust from power stations was examined by a committee set up by the Electricity Commission, which reported that before the problem could be adequately tackled there should be agreed standards for (*a*) a method of testing the emission of solids from chimneys ; (*b*) a method for determining and expressing the size of dust particles.

The task of preparing appropriate standards was referred to the British Standards Institution, and B.S. No. 893 has now been issued. The standard is in three essential parts, as follows :

Part 1.—Method for the determination of the emission of solids from a chimney.

Part 2.—Method for grading the dust by air elutriation.

Part 3.—Descriptions of various forms of sampling tube which may be used in dust sampling.

A number of diagrams are included in the standard, and there is an appendix which deals with the problem of ensuring uniform and uni-directional flow of flue gases ; one of the essentials for the reliable sampling of a dust-laden flue gas stream.

Copies of the Specification may be had from the British Standards Institution, price 5s. (5s. 4d. post free).

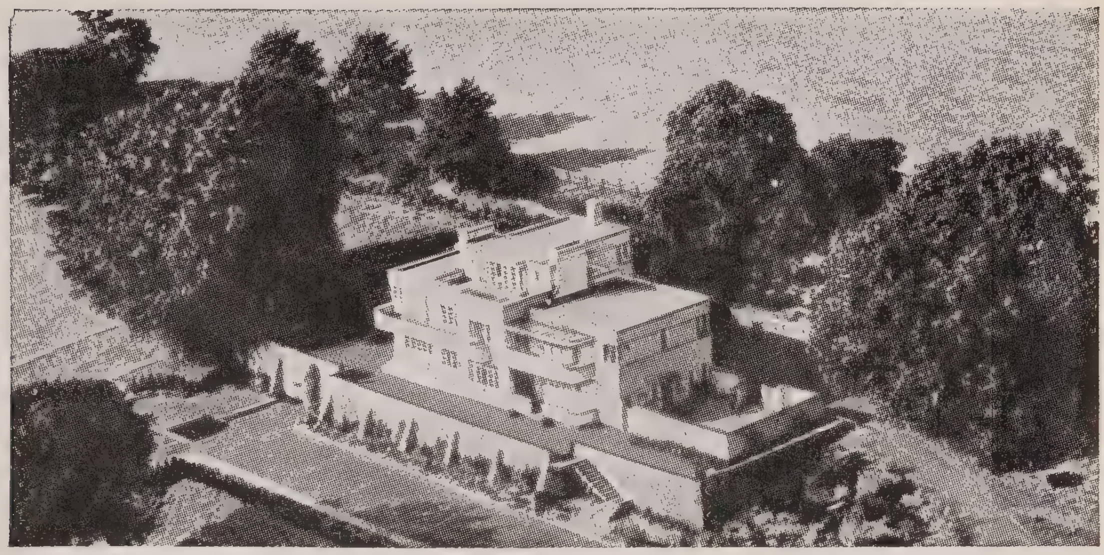
The Fly-Ash Problem in the U.S.A.

As a note to the preceding paragraph, we may quote from an article by Dr. H. B. Meller, of Pittsburgh, in *Coal Heat*, for July, 1940. He writes : " If air pollution abatement is to make the advances demanded in cities it seems clear that ordinances and methods of enforement need to be scrutinised. Excellent work has been done by smoke-ordinance enforcement officials and their staffs, working under the conditions prescribed by law, in many localities.

" The demand is for more law enforcement in abating smoke nuisances and more of this mandatory regulation will be forthcoming in various communities. . . . The control of fly-ash is now considered a necessary part of the smoke abatement programme. The term has come to mean ash plus cinders plus coke—in other words, visible smoke and fly-ash together include all solid products of combustion. Fly-ash is prohibited in 33 of 77 cities whose ordinances were analysed by the Smoke Prevention Association. . . .

" As it is known that emission from domestic and other small chimneys is relatively high in tar and carbon particles and relatively low in ash, it is also known that the reverse is true of the larger stacks with their better combustion and much higher gas velocities.

" The amount of fly-ash which should be permitted has not, as far as is known, been determined. In several cases the limit is set on the basis of density by visual observation. Whatever limit is considered fair, it means that actual sampling is necessary to determine compliance or violation. These are relatively lengthy procedures and the number of tests that can be made is limited." (Quoted from *Smoke*).



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(T.6)

The London & Counties Coke Association, 1 Grosvenor Place, London, S.W.1 Sloane 5136

CHANGES OF ADDRESS

Readers are asked to note that the new wartime address of the Society is

Woodborough, Nottingham

The numerous address changes of members and others since the outbreak of the war creates difficulties in keeping the Society's lists correct and up-to-date. Those concerned are therefore requested to notify us of all such changes, or to inform us of any communications sent to old or otherwise wrong addresses.

In view of the possibility of postal delays or losses at the present time we shall be glad to be informed of the non-arrival of any issues of *Smokeless Air* or of the formal subscription letter sent to members at the beginning of the appropriate month.

ANNUAL REPORT

The 11th Annual Report of the National Smoke Abatement Society, for 1940, has now been published, and all Members and Associates should by now have received their copy.

Copies will be sent on request to other readers and to any inquirers wishing to have further details of the Society and its work.

The Report includes the statement of accounts, lists of affiliated Local Authorities and Associations, with representatives appointed, list of subscribers, and details of all publications published by the Society.

Ships, towers, domes, theatres, and temples lie
Open unto the fields, and to the sky;
All bright and glittering in the smokeless air.

SMOKELESS AIR

The Smoke Abatement Journal

Wartime Issue No. 6 **Winter, 1940-41**
(Vol. XI., No. 44)

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COMMENTARY

Now is the Time

WE hope that many readers will act upon the request made in the article on another page on " The Rebuilding of Britain," and will give us their help in formulating a comprehensive smoke abatement policy for the post-war years. More correctly, we should say an *immediate* policy for post-war action. Now is the time to think about the policy, in spite of the difficulties. Sir Ernest Simon, who speaks with authority on the subject, has just stated that the rebuilding of Britain requires vigorous planning to be begun at least two years ahead, and that unless the plans are ready to be put into force as soon as peace comes the pressure for immediate building will be so desperate that chaos will certainly supervene. There are increasing signs that the truth of this is beginning to be realised, and it is a corollary that if adequate consideration of the element of air purification is to be assured, its practical possibilities must be presented, clearly and definitely, before the general plans become precise in their detail. There is danger that much that is eminently desirable and practicable may be overlooked, and we must make sure that the case for smoke abatement, through any negligence, does not suffer in this way.

Progress Within

Because of this, it is a pity that the conditions of war should relegate smoke abatement to a comparative, though only temporary, obscurity. If there had been opportunity for direct participation in the war effort the stimulus thus given would constantly develop the opportunity for dealing adequately with the many questions of the future. Or if the Society had ever been adequately supported and its active continuity now guaranteed, there might be scope to-day not for one but half-a-dozen full-time trained workers. This idle—alas !—reflection leads to the contemplation of what might be done after the war to develop the *organisation* of smoke abatement upon more satisfactory lines. Little, perhaps, can be expected until wider recognition is obtained, but it is clear that considerable progress is unlikely if the force behind it remains static. Developments of both national and regional organisation appear to be necessary, and some aspects of the work, if not all, may well call for wider municipal or governmental participation. The scope of the movement might also pass on to a phase less restricted than that suggested by the phrase " smoke abatement " (which has little but familiarity to commend it), to include all problems of air purification. Already in the United States there has been evolved the " Air Hygiene Foundation of America," which includes in its scope the examination of industrial air pollution problems.

Welsh Coal in England

The problems of fuel distribution during the present winter were discussed in out last issue, and since then the wisdom of the economy campaign instituted by the Mines Department has been fully revealed. It is interesting to hear that quantities of Welsh coals are now being sent to England, and to hear the Secretary for Mines, Mr. D. R. Grenfell, M.P., in a broadcast, telling his listeners not to listen to nonsense about Welsh coal being impossible to burn in domestic grates. " Hundreds of thousands of Welsh miners have used it regularly in their homes for years, and find it gives a splendid heat." Let us hope that this new acquaintance with Welsh coal will be permanent, and that the smokeless types especially will become more widely appreciated in England. Any analysis of the furtherance of domestic smoke abatement with solid fuel shows the importance of this supply of natural fuel to support developments in the production of carbonised fuels. With modified types of open grate even the harder Welsh coals can be successfully used, and, of course, there is still an enormous field for development of domestic boilers and cookers burning anthracite and semi-anthracite.

Best Wishes, Atalanta !

The 35th Annual Convention of the Smoke Prevention Association of America, Inc., will be held in Atalanta, Georgia, on June 3rd to 6th. The St. Louis convention last year led to an increased membership of the Association, and a large attendance is anticipated. Deprived at the moment as we are of any similar gathering in this country, we are glad to take the opportunity of sending to our friends across the Atlantic our warmest good wishes for the best and most fruitful Convention they have yet had.

Hand-Fired Boilers

As a contribution to the national " Stop Fuel Waste " campaign the Coal Utilisation Joint Council has published a short but very practical booklet on the efficient operation and maintenance of hand-fired steam boilers using bituminous coal (Technical Booklet No. 13). It is pointed out that about 50 million tons of coal a year are burned for steam-raising in industrial boilers, and that it is possible, by improved operating and maintenance conditions *alone*, to effect a saving of at least 10 per cent. in the majority of these plants, with a minimum expenditure of time and money. The saving of four million tons of coal would release 10,000 railway wagons for the transport of other essential supplies. The booklet deals briefly with (1) common faults and how to correct them ; (2) working instructions ; (3) when the boiler is out for cleaning ; (4) mechanical draught ; and (5) wastage of steam. " Coal saving," it is stated in conclusion, " will not originate in the Boiler Room. If the ordinary business methods in use in the office and factory are applied to the boilerhouse by making someone responsible for the systematic examination of boiler settings, firing practice, steam pipes, and auxiliary equipment, fuel economy will soon be obtained." Copies of the booklet may be obtained from the C.U.J.C. at General Buildings, Aldwych, W.C.2.

The Camera Cannot Lie

Most photographers know and value the Handbook and Exposure Calculator published annually by the Burroughs Wellcome people. In the instructions on exposure, that first and decisive step in photography, variations in the actinic value of the light are explained, and referring to a column headed " sun obscured by light clouds or slight mist " in the Light Value tables, the following explanation is given : " Light clouds or slight mist may be present, but the light is still strong enough to throw a slight shadow. This condition is frequently known as ' Diffused Light.' *Even in the brightest weather it is advisable to use this column when working in large towns, to allow for loss of actinic power due to smoke, etc.*" (The italics are black type in the Handbook). Now the column concerned indicates double the normal exposure, which means that for the camera the strength of the light is only one-half what it should be. The old adage that the camera cannot lie is often disputed, but it is still pretty certain that the negative material within it is remarkably truthful, and if it has had only half the light it needs it faithfully records the fact. This is additional support of other evidence that up to one-half of the light available in our towns is obstructed and lost by the overhanging pall of smoke, and it is valuable in coming from a source which has exact standards and wide experience.

THE REBUILDING OF BRITAIN

A First Survey of Smoke Abatement Needs and Possibilities

IN our last two issues we have referred briefly to the need for preparing to meet the problems of the post-war world before those problems are upon us. The situation to be faced will be grave and urgent, and the very intensity of the war makes it more and not less necessary to have ready the blue-prints for the rebuilding and rehabilitation of Britain. This need is now generally recognised, and there is already working that small but essential corps of those whose responsibility it will be to shape the gigantic task of reconstruction and the transition from a war to a peace economy.

In the Government itself, Lord Reith's new Department will apparently be concerned with the actual rebuilding—the bricks and mortar of reconstruction in its physical sense—and it is to Lord Reith that we shall have to look for the first signs of that bold and determined policy that is everywhere desired.

The Minister without Portfolio, the Rt. Hon. Mr. Arthur Greenwood, M.P., is now Chairman of a Ministerial committee considering reconstruction, and from this will emerge in due course a fully fledged Ministry of Reconstruction. Mr. Greenwood, we believe, will prove to have that combination of realism and vision that will be required to enable the nation to rehabilitate itself in a worthy and effective way, and in a recent broadcast talk he summed up the task by saying: " We are planning to get rid of ugliness in our towns, to build a fairer Britain, and to replace hovels by worthy homes."

It is not merely a question of rebuilding and re-equiping all that has been destroyed or damaged by war, but of guiding and making socially beneficial the vast change-over from war to peace production, so as to avoid mass unemployment and the other evils that came in the wake of the last war. And behind these physical problems there is the need for re-establishing the ordered progress and social development now halted or shattered.*

In our preoccupation with atmospheric pollution we do not wish to appear to be trying to give it any disproportionate importance or to seek any priority for its claims, but at the same time it must be emphasised that smoke abatement must be recognised as one of the elements of social progress, not isolated but linked in many ways with other elements, and dependent for its attainment upon further and even more important factors in the nation's economy.

One thing is certain : Britain cannot regain her fairness, nor our towns lose their ugliness, until the blight of smoke, with its attendant grime and gloom, has been ended.

Since smoke reduction naturally follows the increasing efficiency of fuel utilisation there is bound to be some improvement in atmospheric conditions as a result of rebuilding, even though it is only incidental. But, if there is a deliberate and predetermined effort to secure the maximum improvements possible, then we shall be able to take a substantial step towards pure air.

To make certain that this effort will be made and that smoke abatement will be integrated in the plans for reconstruction is obviously the most important immediate task before the Society. Present circumstances make it a difficult task, and even the mere drafting of the Society's policy in the matter is not easy.

This first article must not be taken as more than an individual attempt to think out and outline the problem. Its purpose is to open discussion and to ask others to contribute their own views and suggestions. There cannot be any finality or completeness about such a policy in the face of so much that is unknown, but the sooner the problem is clarified and its essentials determined, the easier will it be to develop and amend the policy as later circumstances demand.

Rebuilding and Town-Planning

Priority in time, labour, and materials will doubtless be given to the tasks of clearing up the devastation of war and of rebuilding that which has been destroyed. Although many residential districts have suffered, the greater part of the rebuilding will be in and around the heavily attacked central areas of towns and cities. Here is a first and test case for smoke abatement, for the proposals for smokeless zones, fully discussed in recent years, were in the main proposals for the establishment, in the first place, of smokeless *central* areas. It has been demonstrated that here the attainment of complete smokelessness would be relatively easy and that the difficulties of both complete domestic and industrial smoke prevention were absent. It is certain that most of the buildings that will be erected in the central areas will be smokeless as a matter of course, and the problem will be merely to make certain that all are. Existing buildings, if not already smokeless, could be made so with little difficulty, and any adequate town-planning scheme should ensure that this is done.

---

* As an example of the kind of discussion that is required reference must be made to the courageous special number of *Picture Post* that appeared on 4th January, 1941.

It should be axiomatic in Lord Reith's Department that all Government buildings and public buildings erected with Government assistance should be entirely smokeless. The old taunt of the blackness of Whitehall must go.

There would, indeed, be little difficulty in extending the area and enacting that all buildings other than dwelling houses and those using fuel for power or processes should be smokeless. The time for such a further development, which would involve much new equipment and appliances, would depend upon the general economic policy in being, but the transition from war to peace production, guided to prevent unemployment and economic dislocation, might well, however, be assisted by the inclusion of work of this kind.

Industrial Smoke

The prevention of smoke from industrial plant will certainly have made no progress as a result of wartime conditions, and the position is likely to be much worse at the end than it was at the beginning. Not only is it probable that much skill in boiler control will have been lost, but boiler plant and equipment will have diminished in efficiency through being overworked and, in some cases, neglected. Damaged works and factories will be rebuilt, new ones will be erected, others will be altered and adapted to new conditions, and there will inevitably be a large-scale demand for new plant and new equipment.

This is a more complex problem, which, if dealt with carefully and with courage, may lead to a very substantial improvement in the smoke nuisance from the chimneys of industry. The abnormal demand for new material that will be experienced prompts the question : Is there any reason why the opportunity should not be taken for requiring the approval by a proper authority of all new

The Rt. Hon. Arthur Greenwood, M.P.

" We are planning to get rid of ugliness in our towns, to build a fairer Britain, and to replace hovels by worthy homes."

boiler plant before its installation and operation, for the purpose of ensuring its suitability, reasonable efficiency, and smokelessness? This is no new method—except in this country—and its adoption would help to standardise technical practice and, in time, would automatically end smoke from this source.

On fuel economy as well as smoke abatement grounds it would be desirable to encourage the replacement of outworn and otherwise obsolescent plant, to which, in the case of small owners especially, there is often an unreasonable attachment. Once again, such procedure might assist the transitional period, and could possibly be furthered by means of credits or even subsidies. It would be a sound item in the necessary work of stepping-up the level of the nation's technical efficiency.

The problems associated with plant for process work in the metallurgical and clay industries are more varied, but again replacement and re-equipment will be necessary in many cases, and, by requiring the use of the best technical advances, could be made with benefit to the atmosphere as well as to industry. There should be encouragement to use the most smokeless method available, and where further research is required for any of the more obstinate problems, it should be included in any planned intensification of industrial research that might be envisaged.

The industrial aspects of town-planning should also be concerned with smoke abatement, especially by zoning and the prohibition of smoke- and fume-producing installations in zones reserved for light industry. There are already examples of this, and the principle could well be introduced into every appropriate scheme. Centralised power and steam supply could frequently be introduced. Such control is of value not only to the neighbourhood, but to those industries which require a reasonably clean atmosphere for their work.

The Domestic Problem

Post-war advances towards a solution of the domestic problem are largely dependent upon the larger issues of fuel policy. A quotation may be made from one of the Society's own publications, *Smoke Abatement in Wartime*, as follows:—

> "Domestic smoke abatement is desirable not only for its own sake, but because it is one factor in the movement towards placing the use of coal on a higher level of economic and scientific utilisation. The demand for smoke stimulates, and at the same time is made practicable by, the use of smokeless coals, the smokeless derivatives of coal, and to a partial extent, improved methods for the use of bituminous coal. The solution of the domestic problem is, in brief, parallel with and dependent upon the problem of using our coal reserves in the wisest and most productive manner. Our coal is too precious and too hardly won to be wasted either in time of peace or in time of war, and true conservation lies in using it to the fullest extent made possible by contemporary scientific knowledge, so that from the fuel is extracted either the maximum of heat and power value or the maximum of the chemical wealth that it contains."

It seems to be necessary, on many grounds, to formulate and put into operation a really comprehensive national fuel policy, and this should deliberately encourage the movement towards a higher level of domestic fuel usage and should also open the road to smoke abatement upon a widespread scale.

In practice this means a much greater use of gas and electricity, the extension of smokeless solid fuel production, the more general use of the natural smokeless fuels, and, while and where raw bituminous coal continues to be used, the installation of grates and appliances that give reduced smoke emission. It would also encourage fuel economy by the use of central heating systems, and would consider the adoption of district heating in suitable areas.

Much of this would be long-term policy applying in the main to existing houses and flats, and it is the rehousing of those made homeless during the war that will have to be the first step—and doubtless the first work to be planned before the end of the war. This, it is hoped, will be done with vision and according to town-planning at its best, but all that is possible will not be accomplished unless it seeks to secure smokelessness—both for its own sake and as an example and token of the kind of rational progress we are meaning to achieve.

Some of the housing will be in the form of flats, and already we have Kensal House, Sassoon House, and others to show what can be done. With the individual houses the pre-war smoke abatement problems will remain, and the same factors of cost, fuel availability, storage facilities, and the need for education in the use of smokeless methods, will demand consideration. But, in the face of the tremendous national efforts that will have to be made, it is ridiculous to consider that this small but important advance cannot be made.

Financial incentives or deterrents to promote smokelessness should also be considered in detail, and might well prove to be a desirable part of wider schemes for town-planning and the restoration of urban amenity.

The great housing developments after the last war afforded an exceptional opportunity for smoke abatement, but unfortunately the means and the movement for ensuring their adoption were not sufficiently advanced, and millions of houses were erected, each one a smoke-producing unit. This time it ought to be possible to do better than that. (Reference may be made to the excellent article by Elizabeth Denby in the issue of *Picture Post* already mentioned.)

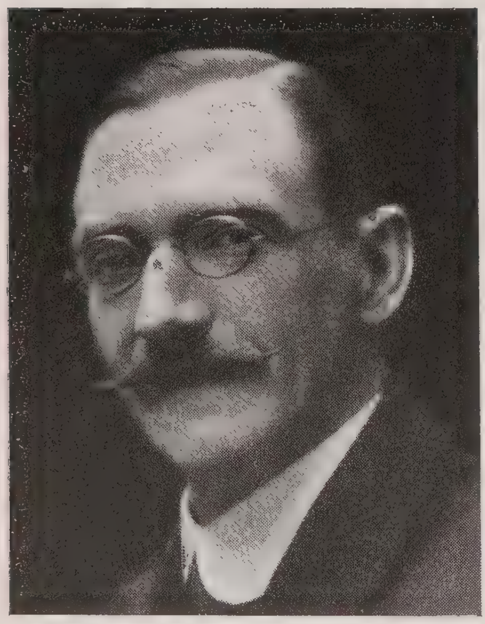
The Cost

The economic soundness of all developments must be assured, but questions of cost must be viewed in relation to the needs of the post-war situation. If public works are necessary for the smooth transition to peacetime production and consumption, then we can justly expect some small proportion of them to be for the purpose of improving the state of the atmosphere. The benefits to the nation will be lasting and will promote the right kind of economy—the prevention of waste.

(*Concluded on page* 82)

Who's Who in Smoke Abatement

Sir Lawrence Chubb



THE smoke abatement movement is only one of many that owe a debt of gratitude to Sir Lawrence Wensley Chubb. Our only regret, as smoke abaters, is that we have not had him all to ourselves, but in our other capacities we are equally grateful for the truly tremendous work he has done for the countryside and the playing fields of Britain.

Seldom on the shoulders of one man can responsibility be found to the extent that it has been *attracted*—that is the word—to Sir Lawrence. He is the exact opposite of the office seeker, in that offices seek for him. And not without reason, as the progress of the movements which he directs so clearly shows. The Commons, Open Spaces and Footpaths Preservation Society has claimed him as its secretary since 1896 ; from 1915 it has shared with him the Scapa Society for Prevention of Disfigurement of Town and Country, and from 1928 with the National Playing Fields Association in addition. He was the first secretary of the organisation that safeguards so much of the beauty of our countryside, the National Trust. Yet with all these and other duties he has been able to give his time, experience, and gifts to the smoke abatement movement, as secretary of the Coal Smoke Abatement Society from its inauguration in 1899 to the time of its fusion with the Smoke Abatement League in 1929, when the present Society was formed. And since then we have been honoured to have Sir Lawrence as our honorary Advisory Secretary.

The C.S.A.S. started amid general apathy or even derision, and went on steadily until, by 1929, smoke abatement was well and truly on the map. This was a great and significant change, not easy to appreciate to-day, and it is safe to say that such an advance would not have been made without the skill and sheer hard work of its secretary. All the early conferences and exhibitions (including the International Smoke Abatement Exhibition in 1912) were organised by Sir Lawrence, and on the legislative side, in which he excels, he had a great deal to do with the discussions and drafting of the Bill on which the Public Health (Smoke Abatement) Act, 1926, was based.

To hear Sir Lawrence state a case makes one realise what success he might have had as either judge or advocate; to observe his grasp of the work and organisation of the bodies with which he is connected, makes one realise that the business world, too, might have claimed him to its credit; but, in addition to these qualities there is a rarer impulse that has made him, and keeps him, a leader in the great crusading movements he has so notably served.

The knighthood that was bestowed in 1930 was a definition as well as an honour.

The Rebuilding of Britain—*concluded*

And the cost of smoke abatement methods must always be balanced, not merely against the methods they displace, but also against the appalling cost of smoke itself. Here we may quote Mr. Arthur Greenwood again. Speaking on the smoke problem, he has said: "I find it impossible, remembering the loss of health and physical well-being, to calculate any balance-sheet which will make it appear that we are any better off because we continue to live in a filthy rather than in the clean atmosphere in which we might live."

Our Responsibility

The harmful consequences of polluted air are so widespread and expensive that the case for reform may at times suffer or be diffused because of the number of reasons for it. It is important to ensure that the problem is seen in its proper perspective by those who are or will be responsible for the nation's post-war effort, and that no opportunity is given for allowing the case to be overlooked. Its consideration is essential to the national health policy, to national, regional, and local town and country planning policies, and to any adequate fuel and power policy. It is necessary to ensure that this need is understood and kept in mind by those responsible for these policies, and that in due course it is implemented by appropriate action.

The Society and others concerned with smoke abatement have a responsibility greater than has perhaps yet been realised; greater, possibly, than at any previous time.

It is hoped that this brief and incomplete outline of the position will receive the careful attention of all who feel that they can help in the task of preparing a complete and more systematic statement. It may be desirable for the Society to issue such a statement before very long, even though from time to time it might need revision. Ordinarily, a work of such importance would first be discussed at a conference and then in greater detail by a committee, but for the moment the ground may be explored by written discussion.

It will be very helpful to have letters from readers on the subject, whether critical, approving, or with suggestions. What are *your* views?

Arnold Marsh.

The Story of the Women's Gas Council

By A.M.S. WILSON, B.Sc.,

Acting Secretary

THE Women's Gas Council was started in June, 1935, as an organisation through which the millions of women who use gas in their homes might represent their opinions and have contact with similar bodies of men and women who work for improvements in national life.

The objects for which the Council stands have been defined as :

Miss M. Wolseley Lewis, B.A.
(Chairman of the Women's Gas Council)

Helping to improve home life by the distribution of information on scientific home management.

Providing a means for housewives to study the latest developments on questions such as diet, food values and hygiene.

Developing a wide understanding of the service of gas both in the home and in connection with housing, smoke abatement, child welfare, and the health of the nation.

Bringing the housewife into closer touch with the manufacturer and the scientist.

In peace-time these aims were developed by educational work and by active participation in social work.

As the Work Grew

The work of the Council is carried out from headquarters in London, and through branches, which in most cases are run by local committees. It is interesting to watch the development of the work. In the early programme of nearly every branch the demonstrations, lectures and debates are devoted to subjects directly connected with the running of the home, but as the branch grows so does the corporate spirit of the members, and their interest extends to matters which affect the community as a whole.

Take, for example, the movement for clean air. This is enthusiastically supported by all the branches, but the subject appealed particularly to the members of the Manchester Branch. The Organiser there is a member of the North-western Branch of the National Smoke Abatement Society and has worked tirelessly for the smokeless area in the centre of the city.

In Cardiff the need for a good milk supply for growing children was great, and as early as the Summer of 1937 the Cardiff Branch of the Council sent a petition to the Government, asking that steps should be taken to make cheap milk available.

Training for National Service

With this interest in community life already aroused, it was not difficult to organise the members into units for war work. By the summer of 1939 sixty-eight classes in First-aid and Home Nursing had been arranged. In many branches courses in large-scale catering and cookery were organised, so that members were able to undertake work in canteens, clubs for service men, and help with midday meals for school children, when the need arose. Within a few days of the declaration of war in September, 1939, much of this work was started, and it has continued without a break ever since.

In one branch most of the members had studied canteen work, so the organiser of the branch became superintendent of a canteen, which has been open day and night since the 12th September, 1939. Each week 122 workers put in some time on duty, and there are understudies ready to take the place of anyone who falls ill. They work in four-hour shifts during the day, with a longer spell at night.

Besides work for the local hospitals, most branches have adopted men in ships, R.A.F. units, or local men serving in the Army; not

The Members' Room, 1, *Grosvenor Place* only supplying them with knitted " comfies " but with parcels of " smokes " and food.

The Mobile Canteen

During the first winter of the war it was decided to present a corporate gift to the men serving with the Forces. Lady Milne-Watson, Vice-President of the Council, and President of the Southend Branch, acted as honorary treasurer of the fund. The appeal was launched in December. The first contribution came from a vulnerable area where meetings could not be held. In less than two months the necessary sum was subscribed, and Lady Milne-Watson presented a mobile canteen to Mr. Austin Pilkington, J.P., Honorary Treasurer of the Young Men's Christian Association, at the Annual General Meeting on St. George's Day, 1940.

The Presentation of the Mobile Canteen to the Y.M.C.A. Lady Milne-Watson, Hon. Treasurer of Fund for the Women's Gas Council Gift to the Forces, and Mr. Chamberlain, of the Y.M.C.A., inspect the Canteen outside 1, *Grosvenor Place.*

Educational Work

From the first, education has been an important part of the work of the Women's Gas Council.

The Council acts in an advisory capacity in the training of Gas Cookery demonstrations, co-operating with domestic science colleges and institutions, and awards a diploma.

Each year a conference is held for demonstrators, where these experts can exchange views and hear speakers on the latest research which bears on their work. At the first conference, held in Cardiff in 1936, there were forty-five delegates. The numbers have grown steadily until over one hundred attended a conference in April, 1940.

Lectures

An official lecturer, qualified in domestic science, is attached to headquarters. When war was declared it seemed as though this part of the work would not go on but before the end of a month requests for a lecturer poured into the office, and all through the past year she has been speaking, not only to branches of the Women's Gas Council, but to meetings of other societies, such as women's institutes, townswomen's guilds, community centres, women's political organisations, women's branches of the British Legion, and women's voluntary services. Food or housing are often the subjects of these lectures. Lately, talks on reconstruction after the war have been popular. Some of these lectures were given at the request of the Ministry of Information and the Ministry of Food.

Out of reports of the national work of the branches grew the idea of a series of leaflets, published once a month. Each branch in turn is asked to be responsible for a leaflet written by a member, giving recipes and describing methods which she uses in her national work either in the home or outside. These leaflets present reliable information in an amusing manner, and are illustrated with little sketches by Harry Rountree. Already popular in this island, these leaflets are becoming well-known in the Dominions and America.

As well as these leaflets, articles on subjects to help the housewife in her war work are published in *Fanfare*, the quarterly magazine of the Council, which also contains reports of the work of the Council.

Membership

In spite of war conditions, new branches have been started and the membership of several branches has increased—one had under 400 members in September, 1939; by Easter, 1940, this number had grown to 700.

Members who have left a district have often sent their new address to the branch secretary. A register of these members is kept at headquarters, and means taken to keep them in touch with the work of the Council by introducing them to the branch in the new district, or by sending them literature.

In all the troubles of wartime, the Council has proved the value of friendship and of united effort, and the members are piling up a magnificent record of national service.

OBITUARY—We regret to record the recent death of Sir Pendrill Varrier-Jones, a Vice-President of the Society, whose interest in the purity of the air was derived from his work on tuberculosis. He was for 22 years director of the Papworth Village Settlement, and here had seen the completion of his great work.

We also regret the death of Major A. J. Martin, M.Inst.C.E., an elected member of the Council and for many years closely associated with the Coal Smoke Abatement Society in London. He was a well-known Sanitary Engineer, and the author of text-books on this subject.

"HEARTHILY WELCOME"

The following amusing prophecy appeared in " Punch " for 18th April, 1891.

1900 (*somewhere about*).—Introduction into London of new Patent Smokeless Fuel, as experimentally exhibited in 1891 before the Prince of WALES and Empress FREDERICK in York Road, King's Cross. A few public-spirited householders insist on their cooks using it in the kitchen. Cooks of public-spirited householders unanimously give warning. No quotation of Fuel Company's shares on Stock Exchange.
1900 (*later*).—Very reforming Parliament just returned. Use of new Fuel made compulsory. Fuel shares go up from a nominal 2s. 6d. a share to £437 6s. 8d. at a bound.
1901.—London already much cleaner. Only two fogs (white) in whole of last winter. Consequent intense surprise of old residents, cabmen, link-boys, porters, and pickpockets.
1902.—Retirement of several individuals, who declare they " liked the good old London fogs ", to Black Country. Statue in Parian marble of inventor of new Fuel Blocks erected on Thames Embankment.
1904.—Government buys up patent rights of Company, at ruinous sacrifice. A Minister of Chimneyculture appointed, with Cabinet rank. Blocks reduced in price, and sold at all Post Offices across the counter. Postal messengers, on receipt of telephonic orders, bring truckfuls to any address within ten minutes.
1905.—Green veils come into general use this summer, to keep off glare from white stone houses and other buildings in West-end of London. Several cases of partial loss of sight from extreme whiteness of dome of St. Paul's. Dean ordered (by County Council) to have dome lamp-blacked. Dean declines. Vote of thanks to him from resident staff of Ophthalmic Hospital.
1906.—Owing to surprising and overpowering health of inhabitants (caused by total absence of smoke and fogs), County Council established Gymnasia, Rowing Matches, and free public Pugilistic Contests, in order to work off surplus muscular energies of population.
1907.—Emigration of 2,000 Doctors (who have no work to do) to one of General BOOTH'S Colonies at South Pole. Show (in Temple Gardens) of delicate ferns and roses grown in atmosphere of Strand.
1908.—Strike of Whitewashers, Laundresses, and House Painters, against lack of employment. Go about singing, " Oh call the Fog-Fiend back to us ! " with refrain, " Oh, when the Fogs were here with us, Would we had used them more ! "
1909.—Last surviving Chimney-sweeper, provided with a well-ventilated chamber at Madame Tussaud's. Special charge of sixpence for adults, threepence for children, for privilege of seeing him.
1910.—Rest of inhabitants of England, as well as foreign invalids, flock to London because of noted purity and salubrity of its climate. Riviera deserted. London a little over-crowded, but very clean.

Some Thoughts on Coke

Further Extracts from the Paper recently read to the Institute of Fuel

By W. Boon

The Quality of Coke

The art of coal blending and/or of coal and coke admixture before carbonisation has obtained most important and encouraging results, and there should be no question that research will continue in this direction. We may envisage, too, the treatment of coke after carbonisation for specific purposes. The domestic market in particular is insistent in its demand for improved quality in fuel, and, to keep pace with its demands, we must contemplate many changes in the future and the adoption of a progressive policy in interpreting and perhaps keeping ahead of the consumers' requirements. For example, I think we shall have to contemplate the dustproofing of coke.

Dustproofing

Because of improved methods of production for the market, coke of low moisture content, delivered to the consumer, frequently creates dust during delivery and in subsequent handling to such an extent as to become a nuisance.

It has been recognised by some American coal and coke producers that to dustproof their fuel was a selling point, which has since been found by consumers (householders particularly) to be such a real one. It is now estimated that about ten million tons of dustproofed domestic solid fuel (coal and coke) are delivered annually in the U.S.A.

The problem of dustproofing coke is quite different from that of coal and has been independently investigated. Its importance has been recognised in this country, and one large gas undertaking, immediately prior to the outbreak of war, was about to investigate research thereon on a large scale.

It is considered very necessary that when normal conditions return such investigation should proceed, especially in view of the widespread desire of producers to improve the quality of coke and eliminate whatever disadvantages it might have had. Coke with the attributes of high calorific value, low ash and moisture content, grading, ignitability, etc., is surely yet a better fuel if the dust nuisance is mitigated if not entirely eliminated.

Some Uses of Coke

Among the uses of coke described by Mr. Boon, the following newer ones, relating to food and agriculture, are of particular interest at the present time.

A Coke-fired Grass Dryer in Use

Artificial Grass Drying

It is now some years ago since it was determined by agricultural experts that if pasture grass could be completely dried within 24 hours after cutting it would retain its high feeding value indefinitely, and could be kept for the winter feeding of cattle so that the addition of costly artificial foodstuffs, mostly imported, could be largely eliminated. In other words, grass, naturally dried, which we know as hay, does not constitute a complete food because of the properties it has lost in the slow and uncertain process of drying in the open. The process of drying by artificial means obviously entails heat and consequently fuel, so that the Association was interested, and has played a large part in bringing the development of grass drying to the commercial position it now occupies. It developed appliances for this purposes which were placed at the disposal of manufacturers and it can be stated that the process of grass drying is being steadily extended.

It can be claimed that the work of this Association has been largely instrumental in putting a valuable instrument into the hands of the farmer which is of international importance, inasmuch as it largely eliminates the importation of artificial cattle foods and safeguards crops against the vagaries of our climate. Further, grass land which is frequently cut is more productive than when it is worked in the ordinary way of growing grass for cutting and field drying to hay. The benefits to the coke industry from the point of view of fuel consumed for this purpose have been considerable, as the absorption represents a very large tonnage, which in effect is completely new business, a new market.

Heating of Animal Houses

A great deal of work has also been undertaken with regard to the heating of buildings for the housing of cattle, and there appears to be little doubt that the provision of good and comfortable housing conditions for livestock and poultry result in increased production by way of growth, fattening, egg and milk production. Animals are perhaps more susceptible to diseases and ailments than human beings and they are healthier and more immune if housed under the best conditions.

Over a long period of time animals adapt themselves to cold climatic conditions by naturally growing longer coats and other means, but they are susceptible to changes in temperature : for instance, young pigs are naturally anaemic, which is the root cause of their peculiar ailments. The moderate heating of farrowing and weaning houses has proved the production of healthier pigs and the saving of life of one pig per litter, which more than compensates the cost of heating. It is believed that much more attention will be given to the heating of animal and poultry houses when the benefits of so doing are more fully appreciated.

Orchard Heating

A comparatively recent innovation in the heating of orchards to counteract the effects of frost when the trees are in blossom, and so prevent possible loss of a whole crop due to a few hours' severe frost, is the orchard heater. Forty to sixty heaters per acre are required ; a simple and efficient coke heater has been produced and is now available for this purpose.

Water Culture

The growing of tomatoes and other crops in chemical solutions without soil has made considerable progress in the United States, and a considerable amount of research work is now being carried out here. Fuel will be required for maintaining chemical solution temperatures.

Drying of Waste Food

Due to the wide experience which the Association has had in the drying of all manner and types of commodities, the Agricultural Research Council approached us in the early days of the war with a view to our co-operating with them in finding ways and means of drying waste food, and a great deal of work has been put into this phase of our war effort, so much so that in London alone over 50 tons per week of dried food of first-class quality for animal feeding is now produced entirely from waste sources.

The last Board of Trade Returns issued before the outbreak of war showed that we imported one million tons of animal foodstuffs, value £5,000,000, in six months. Shipping is now required for other purposes, and the import of animal foodstuff has had to be curtailed. This has led to such a serious shortage, the greater part of which is required for winter feeding, that the Ministry of Agriculture stated on June 3, 1940, " that gradual reduction of the pig and poultry population to one-third must be made by this Autumn, to meet the drastic cut necessary in imported feeding stuffs."

It is estimated that 350,000 tons of waste food from hotels, restaurants and private houses is thrown away every year in town and urban areas. A good start has been made in collecting this, as it can be converted into a valuable feeding stuff, and research is being carried out to find the best method of processing and blending this for animal feeding. This may prove to be a new industry with potential demand for 170,000 tons of coke per annum.

Smoke and Fuel Losses

The Editor,
" *Smokeless Air.*"

Sir,—I was interested to read the article on " Smoke and Fuel Losses " in your last number, which in my opinion states the position clearly and accurately.

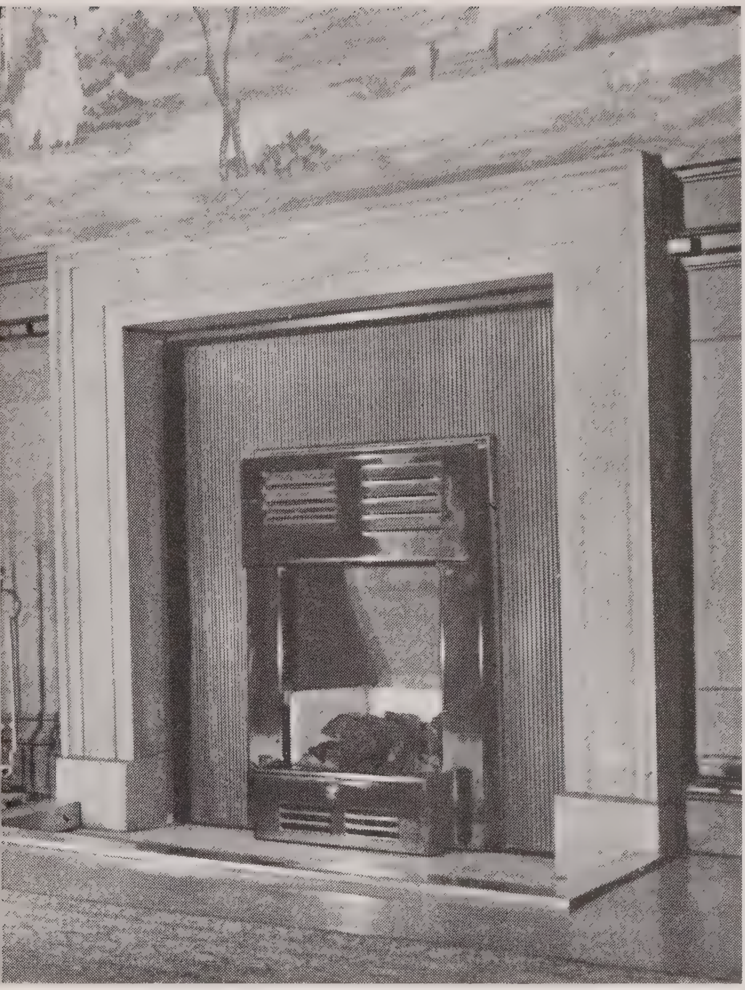
Like the combustion engineers and experienced firemen mentioned, I, too, prefer a chimney emitting a thin smoke to one which is perfectly clear, *provided the furnace temperature is high and there is no air inleakage.*

The point is that if carbon monoxide is formed, the loss is high, and there is a danger of this taking place if the excess air required for complete combustion is reduced too much, but with high furnace temperatures and tight settings the thin smoke haze gives a visual indication that the excess air is cut down so far as it is desirable to go, but if the stack is perfectly clear carbon monoxide is probably being emitted.

On the other hand, if the furnace temperature and condition of the setting are not as I have indicated, the light smoke haze effect is probably due to dilution by high excess air which, as the author of the article states, is bad practice.

I do not think the regular emission of dense black smoke from industrial boilers can be justified except when these are overloaded, and for this state of affairs I consider the Authority who issued permits for the building of the factory in the first instance must be held largely responsible. Pottery and other types of furnaces are in another category so far as smoke emission is concerned.

Yours, etc.,
H. L. PIRIE,
Chief Engineer, Coal Utilisation Joint Council.



The Convector Installed

THE HALES CONVECTOR

Increasing Open Fire Efficiency

IT is well-known that little more than 20 per cent. of the heat value of coal is transferred into the room by radiation from an open fire, and in recent years several fires have been described in which the efficiency is increased by using some of the waste heat, otherwise lost in the flue gases and in the wall into which the fire is built, to warm clean air which is circulated into the room.

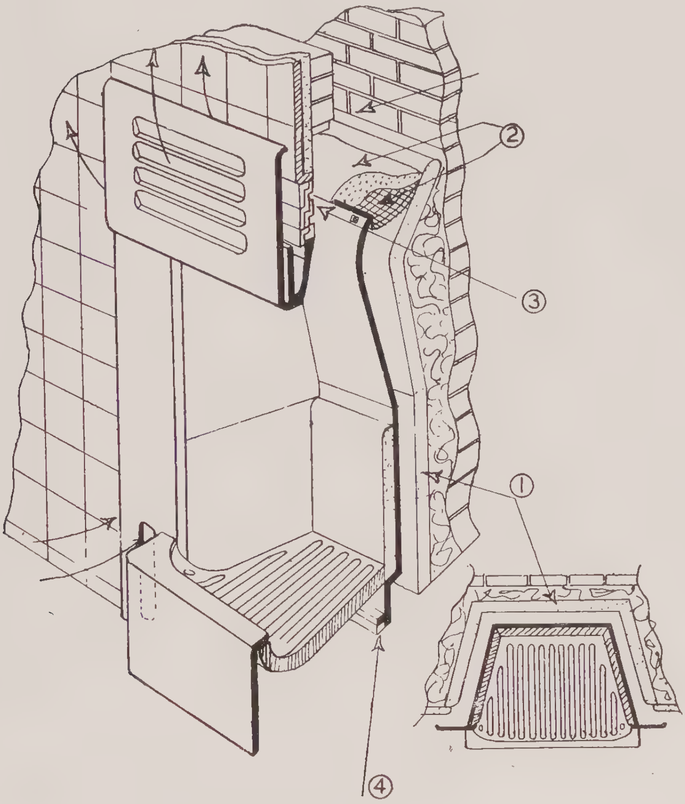
The British Coal Utilisation Association has been investigating the possibility of a simple unit which could be sold at a reasonable price for installation into existing fires, and such a unit has been designed by J. S. Hales, Senior Research Officer of the Association. This is now on the market and is shown in the adjoining illustration.

The diagram will help to show the way in which the Convector is constructed and works. It consists of a cast-iron interior with suitable firebrick fitted into the existing fireplace so as to leave a space between the casting and the original firebrick (1). It is sealed at the base with a fillet of fire cement (4), while at the top the space is sealed with cement held on flexible supports in the form of wire gauze (2) which can be adjusted by the fitter to suit the shape of the chimney, and serves only to support the cement during setting. If the front frame of the original grate is over 22 inches high the gap may be filled by special metal slips (3) or firebrick slips.

The open fire now takes in effect the form of an open-fronted heating stove, into which air is drawn at the base and by contact with the boundary walls of the space provided, becomes heated and is circulated to the room to augment the heating effects of the radiation of the burning fuel.

Tests have shown that although the efficiency of the Convector Fire in terms of radiation alone is 10 per cent. less than that of the ordinary fire, the warm air heating add a further 63.7 per cent., making a net increase in overall thermal efficiency of more than 50 per cent.

There can thus be a considerable fuel saving—stated in practice to be 40 per cent.—or greater heat in the room can be obtained without any increased fuel consumption. The circulation of warm air through the room, in addition to the radiation, means that the distribution of comfort zones is less dependent upon proximity to the centre line of the fire, where radiation is at its maximum. This lessens one of the principal objections and criticisms of the open fire.



Convector Fires have been installed in a number of private houses and the reports of fuel economy confirm the test results. In addition to the efficiency test, it was thought desirable to determine whether the cast-iron fireback was liable to deteriorate by exposure to the flames. A Convector was therefore kept continuously under fire for 1,000 hours at maximum rating, and when examined at the end of this period, the cast iron showed no deterioration whatever, nor had cracks developed in the sealing into the flue.

Although primarily designed for coal fires in ordinary grates, the Convector can, of course, be used equally well with open fires burning smokeless fuels, and will increase their efficiency in use in the same way. It is also welcome from the smoke abatement viewpoint in that its use materially reduces the weight of coal used, and therefore reduces smoke by a similar proportion.

None of the smoke or fumes from the fire can find their way in the circulating air, and the fear, at first expressed, of a stuffy sensation from the warmed air, due to the charring of organic particles, was found to be groundless. The warming effect cannot be strong and abrupt, but is gentle and continuous.

The Convector sells at from 33s. 3d. to 46s. 9d. according to finish (plus purchase tax), and readers desiring further technical information or literature may obtain it from C.U.R.A. Patents, Ltd., 9, Rickett Street, Fulham, S.W.6.

AMERICAN CONFERENCE

The S. P. A. 1940 Manual

WE have recently received the 1940 edition of the " Manual of Ordinances and Requirements," published by the Smoke Prevention Association of America, Inc. In addition to the technical and legal data that comprises the Manual itself the publication contains also the Proceedings of the annual Convention of the Association held in St. Louis in May, 1940.

The Manual is on lines described in previous reviews, and is a handy reference book on many of the combustion problems affecting smoke prevention, as well as the methods for the measurement of pollution. The detailed tables in which are analysed the smoke abatement ordinances and procedures in different American cities are of interest to us mainly on account of the diversity they reveal in comparison with our own unified legislation.

With reference to the suggestion made on another page for the regulation of all new industrial fuel burning installations, it is interesting to note the replies to one of the questionnaire in the Manual. These show that in 60 out of the 80 cities listed new installations and alterations to fuel-burning equipment require to be supervised under Ordinance authority.

In the proceedings of the convention the twenty-one papers and addresses are recorded. Several of these deal with firing methods with different fuels in different types of boiler, and there are four papers on the problems of railway smoke.

A paper on Atmospheric Corrosion by Herbert Kuenzel, assistant Professor of Mechanical Engineering at Washington University, St. Louis, describes the action by which the corrosion of metals in the atmosphere proceeds, and refers to experiments in which iron and steel samples were found to corrode more rapidly in the industrial area of St. Louis compared with the University campus.

Robert J. Piersol of the Illinois State Geological Survey contributed a paper on the Smoke Index, by means of which the extent of smoke production in any fuel can be accurately determined in the laboratory. It may be possible in a subsequent issue to reprint this paper, which contains a number of interesting points.

Some of the points of view and statements made in other papers may be quoted verbatim, and the following extracts have been taken from several of the authors.

Smoke and the Coal Trade

. . . It is decidedly to the benefit of the coal industry to help to solve the smoke problem. Smoke is an evidence of incomplete combustion caused by the wrong or bad-order equipment using an improper type of coal. Smoke is a direct reflection on the coal operator and distributor. A clean stack is evidence of a satisfied customer and a prosperous coal man. All coals will burn smokelessly in some kind of equipment; but be sure that this sentence is complete before you believe it. There certainly is a kind of coal suitable for every available type of combustion apparatus, but we may need a few more burning devices to take care of some available coals.

We cannot afford not to face the smoke nuisance—it is more than a nuisance—it is a poison. The smoke peril will be poison to the coal trade if it is not fairly dealt with promptly.

—*W. E. Koepler, Pocahontas Operators' Association.*

The Law

As long as a large part of the fuel users operate their heating and power plants, including locomotives, with the same recklessness and abandon as is true of the operators of many automobiles, it becomes necessary that the law step in to protect the health and welfare of the public as a whole with regard to clean fresh air. Any automobile can be driven carefully, safely, and within the law if the operator tries. In the same way any fuel can be burned smokelessly, or at least with considerably less smoke, if the plant operator tries, by firing properly—seeing to it that the equipment is in shape—and that load conditions are in proportion to the boiler capacity. When people continue to ignore the fundamental principles of combustion and pollute the air with smoke—fly-ash—fumes, etc., the law must step in. In the same way, when fuel and equipment men fail to give their customer the proper advice and co-operation to burn fuel smokelessly the law may step in and insist on changes to other fuels that will keep the air clean. And the courts have already followed this course.

The old scheme of things of burning smoky, high volatile fuels haphazardly is nearing the end.

Regardless of the efforts expended by physicists, chemists and scientists in the study of air pollution problems, the true benefits of their knowledge of the subject would be largely nullified if the potent hand of the law, intelligently armed with such knowledge, could not be raised in defence of the public's right to a smoke-free unpolluted atmosphere. Education in the non-smoking techniques of fuel use and the seeking of co-operation among fuel users are most excellent but are, in themselves, insufficient to protect the public. Legal control of smoke and air polluting nuisances must be maintained and the importance of such measures cannot be overlooked. The need for such regulations and their importance has only been recognised in recent years. Previous to that time, the issuance of dense smoke was considered to be more or less of a necessity in an industrialised community, but with the advent of medical research into the effects of such nuisances upon the health of the public, the subject of air pollution and its control has been brought more clearly into the foreground than ever before.—*Ralph G. Johansen, Hayes Institute of Combustion. Chicago.*

New Ordinance for St. Louis

Points extracted from a resume of the ordinance passed on April 8th, 1940 :

(1) It prohibits the emission of smoke of a density of 40 per cent. or more.

(2) Definite limitations are placed upon the discharge of fly-ash from plants burning fuel in suspension or partially in suspension.

(3) It specifically states that the railroads are subject to the same requirements as any other user of fuel in the city of St. Louis.

(4) It makes it mandatory for those installing, repairing or reconstructing any fuel burning plant to obtain a permit for such work and the approval of the Division of Smoke Regulation before such work is done.

(5) It requires the Division of Smoke Regulation to make an inspection upon all work which is being done under a permit of the Division and to issue a certificate stating that the work has been done and meets the approval of the Division.

(6) It requires all those selling fuel burning equipment to report their sales to the Division of Smoke Regulation in writing after such sale has been made.

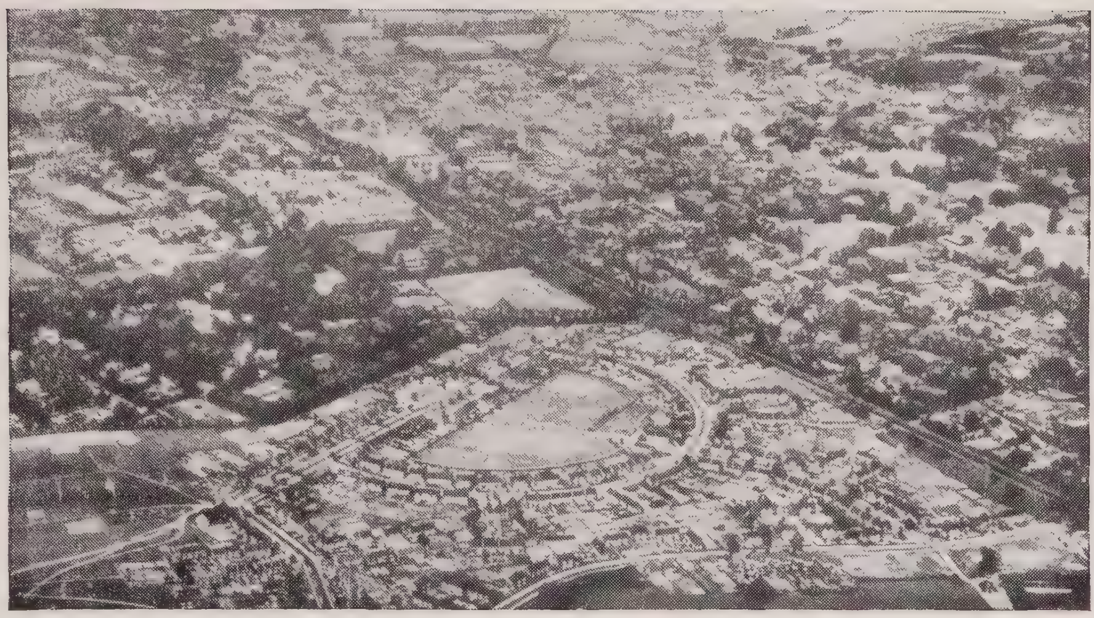
(7) It prevents the Building Commissioner from issuing a building permit for any structure wherein the plans show a chimney or smokestack unless such chimney or smokestack has been approved by the Division of Smoke Regulation.

(8) It prohibits the Commissioner of Smoke Regulation from issuing a permit for any new fuel burning installation unless it is equipped with mechanical fuel burning devices or use a fuel containing 23 per cent. or less volatile matter.

(9) It authorises the Commissioner of Smoke Regulation to seal any fuel burning apparatus if three violations of the law are recorded in any twelve consecutive months. Before such sealing, however, a hearing must be held in order that the violator may have an opportunity to show cause why such action should not be taken.

(10) Finally, the ordinance definitely established the fact that all high volatile fuel must be burned in mechanical fuel-burning equipment and if one desires to hand fire their furnace they must use a fuel containing less than 23 per cent. volatile matter.

You may be interested in the progress that has been made since the enactment of the ordinance. Sixteen railroads serving St. Louis have indicated their willingness to fully comply with the provisions of the ordinance and are rapidly doing so. Low volatile fuel, oil and diesels are being used. Recently, I sent out a letter to all business, religious and educational institutions asking them to signify, in writing, their willingness to comply with the provisions of the ordinance. The response to this letter has been gratifying and through the courtesy of one of our local newspapers the names of those responding to this request are published on an Honor Roll.—*Raymond R. Tucker, Commissioner of Smoke Regulation, St. Louis, Missouri.*



Planning for the Future

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"Now is the time when architects and builders are planning reconstruction — it depends primarily on homes well built, lighted and warmed ; well equipped with bath and sanitary arrangements ; with a hot water supply constant and regular . .

". . . These are among the basic necessities of civilisation, health, contentment and prosperity and would give us a standard of living which other lands could envy."

A Doctor, in the 'Daily Telegraph.'

The London and Counties Coke Association is planning in line with the future pictured by this Doctor —and for a more efficient use of our National fuel resources. Its engineers and technical experts are constantly investigating new and improved methods of domestic and industrial heating.

Open fires which are smokeless, sootless and labour-saving ; hot water and central heating supplied without the need for re-fuelling or other attention for 12 up to 24 hours. These are the outcome of technical research.

Those interested in knowing the latest developments in heating in the Home, in Industry and in Agriculture are invited to send for brochures listed below.

THE LONDON & COUNTIES **COKE** ASSOCIATION

★ SMOKELESS OPEN FIRES ★ CENTRAL WARMING ★ HOW TO STOP FUEL WASTE
★ HOT WATER SUPPLY ★ STEAM RAISING ★ THERMOSTATIC CONTROL
★ CINEMA & THEATRE WARMING & AIR CONDITIONING ★ GLASSHOUSE HEATING
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HOMES FIT FOR HEROES TO LIVE IN!

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Open unto the fields, and to the sky ;
All bright and glittering in the smokeless air.

SMOKELESS AIR

The Smoke Abatement Journal

Wartime Issue No. 7 **Spring, 1941**
(Vol. XII., No. 45)

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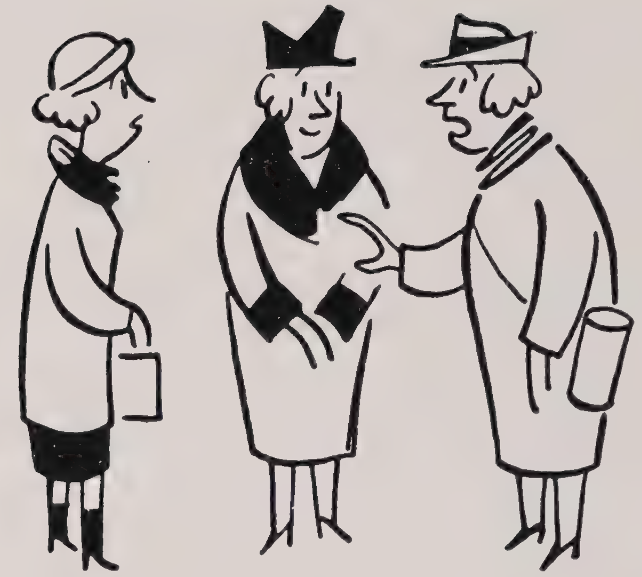

"So I says 'There's no smoke without fire,' I says—"—"But—

—There _is_ a fire without smoke and that's PHURNOD'!"

The ideal **SMOKELESS COAL** for all types of slow combustion stoves, domestic boilers and central heating

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Smokeless Air

COMMENTARY

Determination

ON other pages we publish the Society's first short statement on the part of smoke abatement in the post-war world, and an interesting symposium of views from a number of members and supporters of the movement. From these contributions, and from other indications, it is encouraging to find that as soon as there is a need for it, the interest in smoke abatement that had been rendered largely dormant earlier in the war, at once awakens, and is, if anything, keener and more resolute than before. This mood is in no way peculiar to our own particular problem : it is typical of the general determination that can now be discerned, to make a good job of things after the war ; and is clearly derived from the new high level of resolution that has been aroused in the nation by the war itself. The titanic nature of the struggle for victory makes the tasks that lie beyond the armistice seem well within our capacity, though before the war the effort involved in tackling them would have been thought appalling and beyond our powers. Although the time for doing it is not yet, it is important to ensure that what is to be done should be decided by the nation before the present courageous outlook gives way to the corporate fatigue that will inevitably be felt when the war effort is relaxed and the sirens sound no more.

Planning and the War Effort

We do not think that among our readers there will be many of that small but vocal minority who tell us to forget all about the future and to concentrate wholly on the war effort. Apart from the obviousness of the fact that, as the Earl of Cork and Orrery recently put it,

" it is just as important to plan for peace when you are at war as to plan for war when you are at peace, and a good deal easier," it is likely that post-war planning is of greater direct help to the successful waging of the war than is generally realised. The widespread and serious growth of discussion about reconstruction that has come since the heavy air attacks began is not merely a reflection of our practical nature, but is the expression of a psychological need that, if not repressed and stultified, is the most powerful antidote to despair. The desolation of so much of our cities is, to many, made endurable only by the thought that from it will emerge that which is new and better. The knowledge that the new is already being planned makes fortitude possible and emphasises that the present anguish is but transitory. Lord Reith, as well as planning to bring order out of the chaos of the battlefield, is doing much to maintain morale and the vigour of the war effort.

The Problem of Coal

So much that can be done for smokeless air ought to be done for other reasons too. If, as part of the post-war schemes for rehabilitation and progress, we can at last plan the use of our coal resources on a basis of maximum utility, we shall not only be deriving more wealth (in the form of direct heat, other fuels, and chemicals) from coal, but we shall be taking an essential step towards the final solution of the smoke problem. We now fritter away the wealth that our coal contains in an amazingly prodigal fashion, with a waste that stands out in marked contrast with the new sense of intensive industrial efficiency that has been forced upon us by the exigencies of war. Only perhaps in the use of the nation's land is there to be found such a haphazard and unscientific utilisation of valuable assets. We should be in a sorry plight, to make a bold analogy, if the direction and operation of our Air Force was on the same level as the direction and operation of our Fuel Force. There must be, as so many fuel authorities have in recent years proposed, a National Fuel Policy that, viewing the whole vast problem in its entirety, will develop a systematic and scientifically balanced use of our coal production to give the maximum amount of power and chemical wealth in the most efficient and rational forms. We are glad to reprint the greater part of a recent paper by Mr. John D. Troup on this subject, and hope that the expanding investigation of the question that he proposes will quickly come into being. We, at any rate, will do all we can to have the question ventilated and given support. As will be noted, Mr. Troup stresses the need for smoke abatement as one of the factors closely linked with the major problem, and rightly argues that the economic or financial aspects of a National Fuel Policy should take into account the heavy capital cost to the nation of the smoke nuisance.

The Cost of Smoke

In our next issue we hope to publish the main points raised in the useful discussion that followed Mr. Troup's paper. (Readers who are particularly interested will find the discussion in full in the April number of the *Journal* of the Institute of Fuel). The problem is of great complexity and affords much scope for thought. It is noted from the discussion that Mr. Troup's use of estimates about the cost of smoke was criticised—they were derived from a paper by Dr. J. S. Owens—and that Mr. Pirie seemed very troubled about what he called " these wonderful estimates," complaining that they had never been told the basis on which they were compiled. The fact is, of course, that the basis is adequately described in " The Smoke Problem of Great Cities," by Sir Napier Shaw and Dr. Owens, and corroborative, though entirely independent, evidence was provided by the investigation of the Manchester Air Pollution Board in respect of certain items. The total cost of £40 to £80 millions a year, which is usually quoted, should be understood to be not a precise or complete estimate, but an indication of the *order of magnitude* of the cost. The important point is not the first digit, but the seven noughts that follow it.

On the Height of Everest

To the statistician, and to the ordinary unprejudiced person, some knowledge of the order of magnitude of the grand

A Message from The Minister of Home Security

Not very long ago - Mr. Morrison, after opening the Society's Exhibition at Charing Cross Underground Station, has a word with a cheerful member of a dwindling profession.

I am glad to send a word of good wishes to "Smokeless Air," fighting as it does for an object in which I heartily believe. When the war is over, Smoke Abatement will take its place, with other good causes, as a matter to which we shall be able once again to give the urgent attention that in normal times of progress it fully deserves.

Yours sincerely,

HERBERT MORRISON.

total is sufficient evidence for all practical purposes, and this gives a reasonable idea of the extent of the smoke nuisance and of the damage it causes. It was known, long before accurate measurements were possible, that Everest was a remarkably high mountain, and this knowledge was in no way modified when precise measurements were eventually made. We know that smoke costs us a remarkably large and unnecessary amount of wealth, and we know the region to which that amount rises. Added precision would be useful for propaganda purposes, and we hope that in time this will be possible. But it will in no way modify the understanding of the problem that existing approximations quite conclusively gives us.

The Defence Bond Fund

Inserted in this issue readers will find a folder announcing the opening of a new fund by the Society. We hope that the project will interest all, and imagine that the first reaction of many will be astonishment that we should have ventured to embark upon such a scheme at such a time. We admit that we feel a little audacious in doing so, and quite frankly have no idea, as yet, whether the appeal is to be a real success, a fair success, or—to use the appropriate technical term—more or less of a flop. It all depends on you! Despite the difficulties of the current situation, despite the imminence of higher taxation, despite all the drawbacks, we think that the logic of the appeal is so convincing that it is imperative that it should be made, and made now. The problems that will face us in the future cannot be increased by making this present effort, but they may well be lessened, and we hope that the statement made in the folder on " The Defence Bond Fund " will be carefully read and considered by every member—and by every reader who is not a member.

Dual Purpose

A fund of this kind, which is to be spent after the war, is a patriotic enterprise, because it helps in a small way to further the urgent task of reducing purchasing power. In addition to this, our Fund has the merit that it will be used during the war for directly helping the war effort through the medium of Defence Bonds. This dual purpose appeal is, as far as we are aware, the first of its kind, and we are relying on our readers to help us to justify our hopes and our faith. The appeal will be continued, from time to time, in various ways, but the response to this initial stage will be revealed by the first list of donations to be printed in the next issue of *Smokeless Air.*

More to Read

A change in the make-up of these pages will have been noticed. Room has had to be found for more material, and to include it all without increasing the amount of paper used has meant the use of a smaller type. Double columns make this more agreeable, and the fact that our printers can maintain their excellent standards means that not only is there a considerable increase in the amount of reading matter, but that it is virtually as easy to read as before.

Reporting a Naval Battle

A naval battle about smoke abatement seems to be the height of improbability, but we will let a letter from a member of the Society, now serving in the Royal Navy, speak for itself: " You might be interested to know that candidates for temporary commissions waiting for ships at the home port were invited one day to give a fifteen minute talk on any subject, and so I took the opportunity of pointing out the necessity for smoke abatement in replanning after the war. Was immediately jumped on by two others who proved to be " vested interests " in private life, i.e., coal factors, and the battle became general among 100 sailors and lasted all morning. However, if no good was done, at least no harm was done, and it may have made a few people think." We would say that getting a hundred men to think and argue about the subject did a great deal of good . . . they will remember it next time.

SMOKE AND HEALTH

WE are pleased to have the support of a recent article in *The Medical Officer*, which, commenting on the discussion on reconstruction opened in our last issue, makes a valuable and direct statement on the importance of smoke abatement in relation to health. The article reads as follows :—

" An article in the winter issue of *Smokeless Air*, the organ of the National Smoke Abatement Society, on the Rebuilding of Britain, pleads that when we reconstruct our towns after the war we shall, by deliberate action, leave behind in the ashes of the past the pall of smoke which disgraced them. Obviously, any plan for reconstruction which would be tolerable would automatically reduce the smokiness of our cities, but, whilst we are about it, could not we assure that smoke shall be abolished altogether ? However we may dream of what we want to do, when we come to do it we shall find ourselves restricted by finance, so it is a waste of effort to make plans the cost of which cannot be met ; we must therefore find a way of abolishing smoke which will add little or no extra expense to reconstruction. We can do better than this—we can show that it costs no more to build a smokeless town than a foul one, and by so doing can save immensely on upkeep.

" We are concerned only with the health problems of smoke, and as our case is mighty strong it is best for us to simplify it by using only our most weighty argument, the deleterious influence of smoke in causing respiratory disease. We know that smoke destroys health in various ways and could base our case on any of innumerable factors, but as it is necessary to be as short and sharp as possible in order to get an early hearing, we shall be well advised to frame it in the simplest fashion. All of us suffer from respiratory diseases, and nearly a third of us die from them. We shall not aver that smoke is the only, or indeed the main, cause of this suffering, but we can show conclusively that it is a powerful contributory factor, and that

(*Concluded on page* 16)

First Statement on Reconstruction

THE Society has prepared and issued an " Interim Memorandum on Smoke Abatement in Relation to Reconstruction and Development," as an immediate statement of its views, and has submitted this to the Minister of Works and Building (the Rt. Hon. Lord Reith), the Minister Without Portfolio (the Rt. Hon. Mr. Arthur Greenwood, M.P.), and others concerned with or interested in the general problems of post-war planning.

Aided by the discussions in *Smokeless Air*, and by correspondence arising out of these discussions, a more detailed statement of wider scope is now being prepared and this will in due course be printed in pamphlet form.

The text of the Interim Memorandum is as follows :—

Ampie evidence has been brought forward in recent years to show the seriousness of the smoke nuisance, the progressive reduction of which is desirable on the following grounds, to name three of the major factors :

(*a*) the injury to health and well-being ;

(*b*) the economic wastes and losses involved in both the production of smoke and in its consequences;

(*c*) the degradation of urban amenities and civic standards.

Arising out of (*c*) and particularly relevant to the general problems of town and country planning, may be mentioned the trend of those who can afford it to scatter their homes outside the smoke area, thereby losing interest in the towns in which they work and giving rise to new problems affecting the countryside and transport and other services.

The abatement of smoke from existing fuel-burning installations both in industry and domestic premises presents problems outside the scope of this memorandum, but which are capable of solution under a comprehensive national fuel policy and other appropriate developments. There is, however, immediate scope for improvements under new building schemes and through the medium of town-planning and development. The factors to be considered may be dealt with under separate heads.

(1) " Business " Premises

Under this heading may be grouped all premises other than dwellings and industrial establishments using fuel-burning installations for power and process operations. It thus includes public, administrative and office buildings, institutions, hotels, clubs, shops and stores, warehouses, etc.

Technical requirements and modern practice already result in the majority of new premises of this type being completely smokeless, and no difficulty whatsoever need be expected if it should be stipulated that all new buildings must have smokeless installations for warming, cooking, and hot water supply.

In the opinion of the Society the complete smokelessness of all new premises of this type should be made compulsory.

In practice this means that where solid fuel is used (principally in central heating plant), either it should be smokeless fuel or the appliances should be of a type that will ensure smokeless combustion.

The need for open fires in such premises is very limited and their use should be discouraged except perhaps in rooms used for social or ceremonial purposes. In such cases the use of smokeless fuel should be made obligatory.

It is considered to be particularly desirable that all Government Departments and Local Authorities should set an example to the rest of the community by attaining complete smokelessness in their own premises.

The integration of smoke abatement requirements in general building and development schemes is therefore urged, particularly in relation to the planning of the central areas of the larger towns.

Smokeless Central Areas. One of the most promising lines of advance discussed during the years immediately preceding the war was for the establishment of smokeless central areas. The transition to smokelessness of the premises which in the main constitute these areas—that is, the type here under consideration—was shown to be a problem of no great difficulty, and it was agreed that the benefits accruing from this first step towards smokeless towns would be considerable. To obtain a practical examination of the matter in relation to a specific area the proposal was placed before the Manchester Public Health Committee. The principle of a smokeless central area was approved by the Committee, who instructed the Medical Officer of Health to conduct a survey of the premises in the central area of Manchester. A report of this survey is given in the Health Report of the City for 1938, and this, after tabulating the methods and appliances then in use in the area, concluded by stating :

" The foregoing statistics indicate that in the business premises within the area gas and electricity are utilised to a considerable extent for heating purposes, and in addition over half the solid fuel which is consumed is smokeless.

" As such a large proportion of the heat and power used in the area is already produced by smokeless methods, it would appear to be a practicable and economic proposition for those commercial concerns which continue to pollute the atmosphere by smoke, to follow the example of their more enlightened neighbours."

The new building now required in many central areas can readily incorporate smokeless methods, and, as the above example shows, the conversion of existing buildings to smokeless operation is feasible. There should, therefore, be no difficulty in embodying the principle of the smokeless area or zone in all appropriate building and development schemes.

It is respectfully urged that this question should receive careful consideration.

(2) Industrial Smoke

The prevention of smoke from industrial operations is partly a matter of equipment and partly of operation. In new industrial premises it should be possible to ensure the installation of plant adequate and suitable for its purpose, and capable of being operated smokelessly. The Society may be able shortly to make more precise suggestions on this point.

In areas subject to town-planning schemes the zoning of industry has already made some progress, and light industrial premises adjacent to residential or central areas can be controlled by :

(*a*) prohibiting the use of individual fuel-burning plant ;

(*b*) stipulating the use of smokeless fuels only ; or

(*c*) supplying power and steam from a central source efficiently operated and supervised.

Examples of such control include the Wythenshawe industrial zone, Manchester, the Scottish Industrial Estate, Hillington, the Team Valley Estate in County Durham, and others.

It should be borne in mind that measures for smoke control are of value not only in their main purpose of preventing air pollution, but also because they encourage technical efficiency and the better utilisation of fuel.

(3) Domestic Smoke

The general solution of the smoke problem from domestic chimneys is dependent to a large extent upon a fuel policy that will make available larger quantities of open-grate fuels, and further encourage the use of electricity and gas. Under the conditions likely to prevail immediately after the war extensive changes affecting existing dwellings may not be practicable, although as a long-term measure of national development such an objective is desirable.

Full advantage can, however, be taken of the possibilities of smoke prevention in zoning new housing areas, and in the building of flats. The practical considerations involved cannot be dealt with adequately in a short memorandum, but it is suggested that the question should receive specific examination, in which the Society can give further assistance, as a factor in the general planning of post-war housing.

Who's Who in Smoke Abatement

Dr. R. Veitch Clark

Photo: F. W. Schmidt, Manchester

IT is appropriate that Dr. R. Veitch Clark, a member of the Executive Committee of the Society, should be in our "Who's Who" series on this occasion, for it gives the opportunity of offering the Society's congratulations to him on his recent appointment as one of the King's Honorary Physicians.

Dr. Clark has been Medical Officer of Health to Manchester since 1922. He received his university education in Edinburgh, where he took the M.A. degree before his medical degree. After residence in Tottenham hospital he joined the University of Leeds as a lecturer in physiology, took the diploma in public health at Oxford in 1907, and returned to Leeds as assistant medical officer and lecturer in public health at the University. A few years later he was appointed Medical Officer and School Medical Officer at Croydon, a post which he held until he succeeded Dr. James Niven in Manchester.

Like many sister cities, Manchester to-day has her tribulations and her hopes for to-morrow. Her old reputation for smoke and grime has not been undeserved, but there should be even greater recognition given to the steady and systematic struggle for a cleaner atmosphere and a brighter city. It is this struggle which has made Manchester a centre for the smoke abatement movement, and this position has been well maintained by the deep interest of Dr. Clark in this subject.

His work for smoke abatement has been continuous, and he has been backed by a support that to a large extent may have been engendered by his own enthusiasm. Manchester and District formed the first of the Regional Committees in 1924, with Dr. Clark as secretary, and but for the intervention of national crises on two occasions this would by now almost certainly have become a statutory Joint Board for South-East Lancashire. Many difficulties and doubts had to be overcome in securing the acceptance of this larger project by the authorities in the area, and the success is largely due to the untiring efforts of Dr. Clark. As a member of the Executive Committee of the N.S.A.S. for many years, Dr. Clark's counsels have always been a weighty factor in the making of decisions. Often he has summed up, clarified, and drawn indisputable conclusions in quiet, well-measured words. Dr. Clark's spoken words have, indeed, a ring about them that compels attention, and on the platform he reveals an eloquence and fire rarely met with outside the ranks of those to whom the art of oratory is a necessity.

The effects of smoke upon health have naturally been Dr. Clark's chief concern, and it will perhaps not be far from the truth to interpret as a sign of a deep idealism the fact that he has always stressed most vividly one particular aspect: that the smoke clouds bring darkness and hide the light, and that in our minds darkness and gloom are always associated with pain and misery; light and brightness with joy and life. The dark days of the smoke age are drawing to an end, thanks to all those who, like Dr. Clark, labour towards the light.

THE REBUILDING OF BRITAIN

A Symposium which continues the discussion opened in our last issue

WE are glad to be able to publish a number of contributions, written from different points of view, on what is becoming the Society's most important wartime activity. Further expression of opinion is invited for publication in subsequent issues. In the next issue the discussion, as far as it has gone so far, will be reviewed by Mr. Charles Gandy, Chairman of the Society's Executive Committee, who will in particular examine the question of Smokeless Zones and Central Areas—perhaps the most promising line for immediate post-war development.

By Alderman David Adams, J.P., M.P.

The unconstituted world which will take rapid shape after the great armistice must, as a matter of course, be freed from all avoidable smoke pollution. If not, the health and amenities of our population will remain impaired and needless waste and toil continue. Our purely industrialised areas can, with the aid of modern science, be revolutionised in this field.

The smoke plague, with its heavy financial, industrial and social burdens, is as unnecessary in this era as overcrowding, slums and poverty, and must like these be doomed to extinction.

The new Ministry of Works and Buildings, successor to the Office of Works, has doubtless resolved that this task is one of prime urgency, and that in their plannings of areas and buildings smokelessness must universally prevail. The new Government departments now being erected in Whitehall, I have been assured in Parliament, will be centrally heated and smokeless.

It may be of interest to mention that when I occupied the chair of the Standing Conference of Co-operating Bodies in the Investigation of Atmospheric Pollution under the Department of Scientific and Industrial Research, a practical step was taken towards smoke elimination in the Whitehall area. With the cordial assent of the First Commissioner of Works, the late Sir Phillip Sassoon, M.P., I had altered, at the charge of a London business firm, some forty coal burning fires in the Houses of Parliament and offices of certain Ministries, to the use of smokeless fuel.

Subsequently, tests were made extending over some months, by Ministry experts as to the economy, warmth, and general comfort of the smokeless fuels. Two officials only, of the staffs concerned, expressed preference for coal fires, and, sad to relate, these were restored to them! Substantial economies in the use of coke and against coal were reported. For defence reasons this use of smokeless fuels has had to be discontinued, but after the war will doubtless be resumed and extended, as

Sir Phillip Sassoon desired, throughout all Government departments and the Houses of Parliament.

Let this example be universally followed at the first call for reconstruction!

By C. Gustave Agate, F.R.I.B.A.

President, Manchester Society of Architects.

It should not be necessary to insist upon the vital part which smoke abatement (who not smoke abolition while we are about it?) is going to play in post-war reconstruction, but the general public is admittedly either sceptical or mentally inert on the subject.

That this should be so requires some explanation. It will, I believe, be found to have rather deep psychological roots—those of habit. " W'ot were good enough for my fayther's good enough for me," sums up the Lancashire complacency about dirt. Noise and smells come into the same category of association.

Is it too provocative to suggest that the Lancashire character derives some of its ruggedness, as well as its aesthetic obtuseness, from the same source? Yet this is one of the problems of social planning for the future—the provision of compensation, to go with a higher order of living, for the disturbance of an equilibrium achieved in the past.

The same difficulty attends every step in planning for reconstruction, and the only solution is what might be called the co-ordination of interference. This is the motive behind the steps now being taken by the new Planning Committee of the Manchester Society of Architects, which are to try and weld the ideas of all societies and other bodies interested in reconstruction into some semblance of a coherent force to influence public opinion.* The next step will be to apply that force to stimulate and inspire public imagination to the possibilities of living of the future.

By Sir Alfred Beit, Bt., M.P.

It is to be hoped that after the war, when the general problem of reconstruction and rebuilding will assume gigantic proportions, a sterner attitude will be taken by the Government and Local Authorities towards pollution of the atmosphere.

Much progress has admittedly been made up to the time of the outbreak of war, towards a purer air, but the whole question has been left far too much to the good will of the individual. Perhaps it is natural that the greatest advance has been made in the industrial world, for it is here and here only that penalties attach for undue emission of smoke. Yet a great deal more could be done, as a pre-war visit to any industrial area would have shown.

The war has indicated how effective compulsory powers can be taken without arousing undue opposition, provided they are in the national interest. What better interest could be served than that of a purer atmosphere? The United States and, nearer home, Cardiff, have shown how entire cities can be transformed by the use of proper fuels and the prospect of a no faster progress towards this end than achieved already is indeed depressing.

Business premises and the home must come into line, not only as regards new building (where common sense and more economical devices are the best enemies of the open fire) but in existing offices and houses. The open grates in the City of London offices must be one of the greatest of modern anomalies, and their effect is visible on every wall and every brick in the City. The domestic consumer, who in any case turns more and more to electricity and gas in his own interest, should be given a time limit for the installation of smokeless grates or the use of smokeless fuel. The benefits of such a policy will soon be evident.

By Miss Marion Fitzgerald, A.R.S.I.

When the war is over many new houses must be built to make up for the shortage which will have accrued as well as to replace those destroyed by enemy action. Further, a very large number that have suffered severe damage will need drastic reconditioning. It follows that a really great opportunity presents itself to stress the importance of smokeless heating in the plans which will, one hopes, be prepared well in advance.

We may reasonably expect that when

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* In the next issue we hope to publish a full account of this new Committee, and of the idea behind it. It is a development of great interest.—Ed.

hostilities cease the gas and electricity industries which had made such conspicuous advance in the direction of improved services and favourable tariffs will go ahead with new developments as soon as they recover from the set-back of the war. Every house, even the smallest, should be so equipped that the fullest use may be made of them. But the crux of the problem will be then, as now, the open fire, which almost everybody desires and ought to have in our relatively sunless climate. The British population, even after the chastening experience of the severe restrictions and regulations of the present war will not, in all probability, be ready for the prohibition of burning raw coal. We must, as before, depend on improved apparatus and good quality smokeless fuels but, as we did not do before, we must educate the householder in the proper use of them. The plan tried experimentally before the war of fixing grates specially constructed to burn smokeless fuel ought to be made universal. No hardship is done to the tenant, who can, if he is foolish, continue the use of raw coal. Meanwhile, the way is open for three probabilities : (1) the gradual reformation of the unwise tenant ; (2) that future tenants will have been educated in clean-air mindedness ; and (3) the prohibition by law when the time is ripe of the use of raw coal in domestic grates.

Although specially constructed grates are not essential for low temperature cokes these do undoubtedly burn more freely when air can be admitted below the fire-bed, and this should be borne in mind where the proposal to adopt coke-burning grates is not adopted.

By Sir Francis Fremantle, O.B.E., M.D., M.P.

In 1920, as Chairman of the L.C.C. Housing Committee, I was the author of the Becontree scheme for the building of 29,000 houses on virgin land and responsible for many other schemes, defects and all. Since then the electric grid and developments in the gas industry have made smokeless planning more feasible ; the war with its " blitz " and night-shelters may favour modern methods. But two essentials must be borne in mind : (*a*) ventilation, and (*b*) the people's psychology. An open grate should always be provided in the living room ; but the room should be fitted for gas or electric connection if desired. Man will often change his habits and tasks to conform to modern needs if he can do so tentatively at first without burning his boats : still more so if he could have both available for a time so as to prove each system by frequent comparison under the conditions of his own use and taste.

The health-giving value of a smokeless atmosphere should be stressed. Our late friend, Dr. Saleeby, is justified by the general acceptance of the value of light and of vitamins in maintaining health, as in treatment of disease. The war has opened all eyes to the need of fruit and vegetables and to the reason of it—the health-giving powers of sunlight upon which the ripening depends ; it is taught in the schools ; it is shouted from the roofs. The possibilities of a smokeless atmosphere, especially in the areas to be replanned and rebuilt and in new areas to be developed, are not mere dreams of beauty but are practical certainties, combining health, efficiency, economy and the joys of sunshine.

But we must take the people along with us in this policy—through the Press, through every opportunity for influence, and, not least, through local public opinion, influencing the Local Authorities and the agencies of Industry, on whom its adoption and success will depend. Members and candidates, both in Local Government and for Parliament, are useful and proper targets for any propaganda in the public interest.

By Dr. Julian S. Huxley.

Smoke abatement should form an integral part of any comprehensive planning scheme. So long as industrial concerns and private householders are allowed to pollute the air with the mixture of dirt and corrosive and poisonous substances that we call smoke, it will be difficult to make our cities beautiful and impossible to keep them healthy to live in. No question of cost should be allowed to stand in the way of this reform, any more than it should be allowed to stand in the way of the physical replanning of cities. In both cases the cost to the community of allowing the present state of affairs to continue far outweighs the cost to private interests involved in remedying it. Once we strike our balance sheet in social instead of individual and purely commercial terms, smoke abatement is seen to be profitable and necessary.

By Dr. J. Johnstone Jervis,

Medical Officer of Health for Leeds.

If a phoenix is to arise from the ashes of our devastated cities let it be a smokeless one. We should be guilty of the gravest oversight is we neglected the opportunity of eliminating smoke and dirt and all the ugliness which accompany these when we begin once more to rebuild the towns and cities of our country which have been ravished and desolated by war.

Smoke cannot be justified on any ground, personal, aesthetic or economic. It is a travesty of our modern civilisation and should be abolished. We must not allow the subject to be forgotten for lack of emphasis, and if necessary, reiteration.

By James Law,

Chief Smoke Inspector, Sheffield, Rotherham & District Smoke Abatement Committee.

A comparison between " present " and " post war " conditions is difficult, because a relaxation of control has shown that pollution is increasing daily and will continue as long as this is allowed—in other words—" Liberty has resulted in Licence."

Admitting that production is at a maximum, the word "economy" appears to have been completely forgotten, except by certain Cabinet Ministers in their speeches.

The future will bring unique opportunities for Town Planning and Zoning which, if lost, will provide just cause for reproach by later generations.

Regional Town Planning has been slowly developing and Regional Smoke Abatement has been tried experimentally. This latter has been eulogised by one of our leading Ministers as the only logical solution to pollution difficulties. Is it too much to hope that Town Planning and Smoke Abatement can be considered with a single object in view —that of making the future cities and areas places fit to " live in " and not to " escape from " ? Town Planning Committees are already at work, but how many of them are considering " complete " zoning ; and how many of them have included one or more Combustion Engineers who can give the necessary advice and assistance in order to define what shall be excluded and what types of heating apparatus shall be allowed ?

American and Canadian cities insist that plans of steam raising and heating apparatus shall be submitted to, and approved by, the Local Authority before being installed, and this has had an undoubted influence on atmospheric conditions.

It appears that the following conditions at least can be asked for :—

1. *Regional Planning* with powers to supervise all steam raising, heating and process plants.
2. *Complete Zoning*—Residential Areas, Central Areas, Light Industrial Areas and Heavy Industrial Areas.
3. At least one co-opted member of the Committee capable of advising and assisting in matters of combustion appliances.

By Professor C. H. Reilly, O.B.E., M.A., F.R.I.B.A.

Clean air is one of the first requisites in making our towns once again desirable places in which to live instead of places from which to fly. The main excuse and reason for the spoiling of the countryside with cheap, ungainly shacks and bungalows, and all that they imply, is that the towns are too dirty to live in. If the rebuilt areas are to remain bright and clean and attractive they must not only be smoke free themselves but unsurrounded by the smoke of the older areas. A tax on the burning of untreated coal in an open grate and serious fines for misused furnaces seem to me the most direct and simple ways of achieving this.

If the new areas, as many think, are to be built of prefabricated materials both to save time and to achieve a new cheerfulness, the need for a clean atmosphere is stronger than if the houses are to be built in brick or stone. Brick and stone absorb dirt slowly and with a certain dignity, whereas hard materials like tiles, faience and glass very soon become streaky and unpleasant. It is the difference between a linen collar and a celluloid one.

By Allan W. Ritchie,

Chief Sanitary Inspector for Edinburgh.

It is well that the National Smoke Abatement Society should anticipate the reconstruction and development which must take place on the return of peace conditions. Public opinion has been so awakened within recent years in regard to atmospheric pollution by smoke that it may be expected that this subject will receive particular attention when the war is over.

No great difficulties are presented in making public buildings, institutions, hotels, clubs, shops and stores, warehouses, etc., practically smokeless. It is only a matter of adopting modern methods such as coke in central heating boilers or automatically controlled mechanical stokers, gas or electricity. In the central area of Edinburgh, comprising Princes Street, George Street and neighbouring streets, which is now practically smokeless, most of the establishments are heated by one or other of those methods.

It should be made compulsory that new buildings shall be smokeless. This requirement should also apply to alterations in the heating plant of existing buildings.

It is regrettable that there is at present no control over the installation of or improvements upon industrial plants. The subject of smoke is seldom considered and it often happens that action has to be taken to deal with new plant after installation. So much progress has been made with smoke-preventing apparatus that it should now be possible for boiler-makers to include the apparatus as part of the plant.

One solution of the smoke problem on the industrial side is undoubtedly the supply of power and steam from an efficiently operated central source to individual factories. A plea is often put forward, however, that in factories where steam is required for process work, of which there is a considerable number, the continuance of the use of steam as the source of power is necessary instead of changing over to electricity.

Practical Help.

In spite of the multitude of demands for subscriptions of one kind and another made upon one's purse nowadays, I am doubling my small subscription this year as I have been impressed by the zealous desire (as shown in your magazine *Smokeless Air*) to keep this important work alive and ready for action when hostilities cease.—*Miss D. K*——.

SMOKE AND HEALTH—*concluded*

its elimination would do more for health than all the sanitary improvements of the past fifty years. The influence of foul air has not the dramatic character of that of foul water, for there is no disease caused directly by it, and it is not concerned in producing epidemic situations recognised as such. This, however, is due to traditional bias—we speak of epidemic diarrhoea, but not of epidemic bronchitis, though if we explore without prejudice the phenomena of infantile diarrhoeal and respiratory infections we find no reason for our traditional discrimination between them ; but we are still enslaved by the myth of zymosis. For our purpose it is not difficult to show that the respiratory diseases rate of towns varies directly with their smokeness, particularly with regard to young children in whom infection plays the predominant part. In fact we might keep to the respiratory factor of infantile mortality, which is the easiest item upon which to obtain satisfactory statistical evidence.

" If our plan for smokeless cities entailed great additional expense in rebuilding, we should be hardly more likely to get a hearing in the future than we did in the past, but it costs less to build a house which cannot produce smoke than one which does, and though it does cost more initially to install a smoke-consuming factory than one that is not, it is cheaper in the long run. The tradition of the fireplace and the chimney obstructed us in our rehousing after the last war, but there are many reasons for believing that this tradition has loosened and, with a little persistence it may be abolished altogether."

A POST-WAR NATIONAL FUEL POLICY

A Paper by John D. Troup

AT a meeting of the Institute of Fuel held recently in London, a paper was read by John D. Troup, M.I.Mech.E., M.I.Chem.E., F.Inst.F., on "Some Notes on a Post-War National Fuel Policy, with Suggestions for a Practical Plan."

Mr. Troup linked his argument closely with the need for smoke abatement as one of the reasons for the establishment of such a policy, and expressed the view that in the coming period of development the Institute of Fuel would play an important part.

"The importance of our responsibility is evident when we remember that the wealth and greatness of this country have been built up on the basis of our native fuel. Other nations have since followed our example. We, however, are still using our native fuel in the same primitive manner that it was used at the beginning of the industrial era, with the exception of the carbonising industry, where again we lead the world, but this industry deals with only a relatively small proportion of our annual coal consumption. It is true that we are also transmitting our fuel energy more effectively by the medium of electricity, but here again we are using our fuel in the same primitive manner, even though combustion is carried out in a highly scientific manner. A very large proportion of our native fuel is also still used in a primitive domestic grate and in small furnaces.

"There are two principal defects in this primitive use of our native fuel, namely, the pollution of the air we breathe, and the loss of products which have a higher value than raw fuel. There is also another important aspect of the problem. Modern conditions require the application of heat in a manner that will give the highest efficiency for a particular process, and this requirement cannot be met efficiently by using our native fuel direct; it must first be transformed into the gaseous or liquid state, or converted into electricity."

Mr. Troup went on to review past efforts to bring about a policy whereby we "could use our native fuel in a manner to conform with the conditions of our modern age," and showed that although there was yet no such policy there was a mass of authoritative opinion urging us on to a more scientific utilisation of our native fuel. "After the last war the Samuel Commission made a most comprehensive inquiry into our fuel problems, and in their recommendation for a National Supervisory Body gave emphasis to the following: 'No comprehensive survey has been made of the heat, light and power requirements of various industries, or of the country as a whole, and how they can be most economically met by the various processes at present commercially feasible: still less has the broad question been considered from the point of view of possible development in the future.' The Commission considered that such a survey was imperatively required and that the survey should be taken by a body of a permanent character.

"Since the Samuel Report was published the problem has been dealt with by many authorities, and the keynote of all their efforts may be said to be co-ordination. Members of this Institute will be familiar with these efforts, and the list includes such names as Sir Arthur Duckham, Lord Hirst, Lord Cadman, Sir Philip Dawson, Prof. Egerton, Colonel Bristow, Mr. Boon, and many others.

"In addition to the above efforts, there have been published certain Government Reports, as well as 'Labour's Plan for Oil from Coal.' It is also significant that the subject is so frequently raised in the House of Commons by means of question and answer."

The Ideal

Dealing with the advantages of such a national policy, Mr. Troup said: "The ideal we are considering naturally means the processing of raw coal by various methods. It is not proposed to deal with such methods in detail here, as that is a problem for teamwork, and would come up for consideration when the appropriate body comes into existence for the detailed consideration of our National Fuel Policy. It is, however, evident that our ultimate ideal would mean the building up of a great new industry, possibly in conjunction with the existing carbonising industries. Such a development would be the means of creating new wealth and increasing employment and all the subsidiary advantages resulting from the development and operation of a new industry.

" The development of a national coal-processing industry would be the beginning of a plan which would ultimately abolish the emission of smoke to our atmosphere. There would remain the problem of acid fumes and dust discharged to the atmosphere, but this would come up for consideration when the detailed plan was under review. A great effort as been made in recent years to educate public opinion regarding the harmful effects of atmospheric pollution, and this work will doubtless be a valuable asset in helping forward a National Scheme. Some progress has already been made by the extending use of smokeless solid fuel, and also in the use of gas and electricity for heating purposes. There still remains, however, the open d mestic grate, which uses a large percentage of our annual production of raw coal. The solution of this particular problem is one of bital importance, both from a human health and economic point of view, and its importance has long been before us. It may be of interest to recall that at the beginning of the modern gas-producer era the late Dr. Ludwig Mond visualised a smokeless England through the medium of the total gasification of coal.

Coal as a Raw Material

" Since those days our knowledge of coal and its potentialities has increased at a rate which must have been beyond the vision of any ordinary mind. Thus, to-day, when we consider the vast field open to processes using coal as the basic raw material, we see, not one new industry, but a multitude of industries within practical vision, and others ahead if we only have the faith and courage to provide a much greater organisation for research. It has become the custom to refer to the products derived from coal as by-products ; but it would seem that the time has arrived to view the matter from a new angle, and consider coal as the raw material for a manufacturing process providing a multitude of products required by the age in which we live. This section of a National Fuel Policy is one of the very greatest importance, and one holding potentialities which seem to offer possibilities of development on a grand scale."

The author referred to the value of such developments in the transition to peace-time production, and the standardisation of equipment, followed by more automatic control, that could come from the availability of fuels in relatively simple forms. The transport side of the problem would open up vast possibilities, and there were important potentialities in the use of compressed gas, producer gas, and liquid fuel derived from coal by different systems. Liquid fuel particularly called for attention because transport by air was only in its infancy and this field would create an ever-increasing demand.

Dealing with the economics of the scheme, Mr. Troup urged a flexible mind, and though the balance sheet must be the test we were living in an age where there seemed to be a widespread feeling that we must revise our outlook on the whole problem of economics.

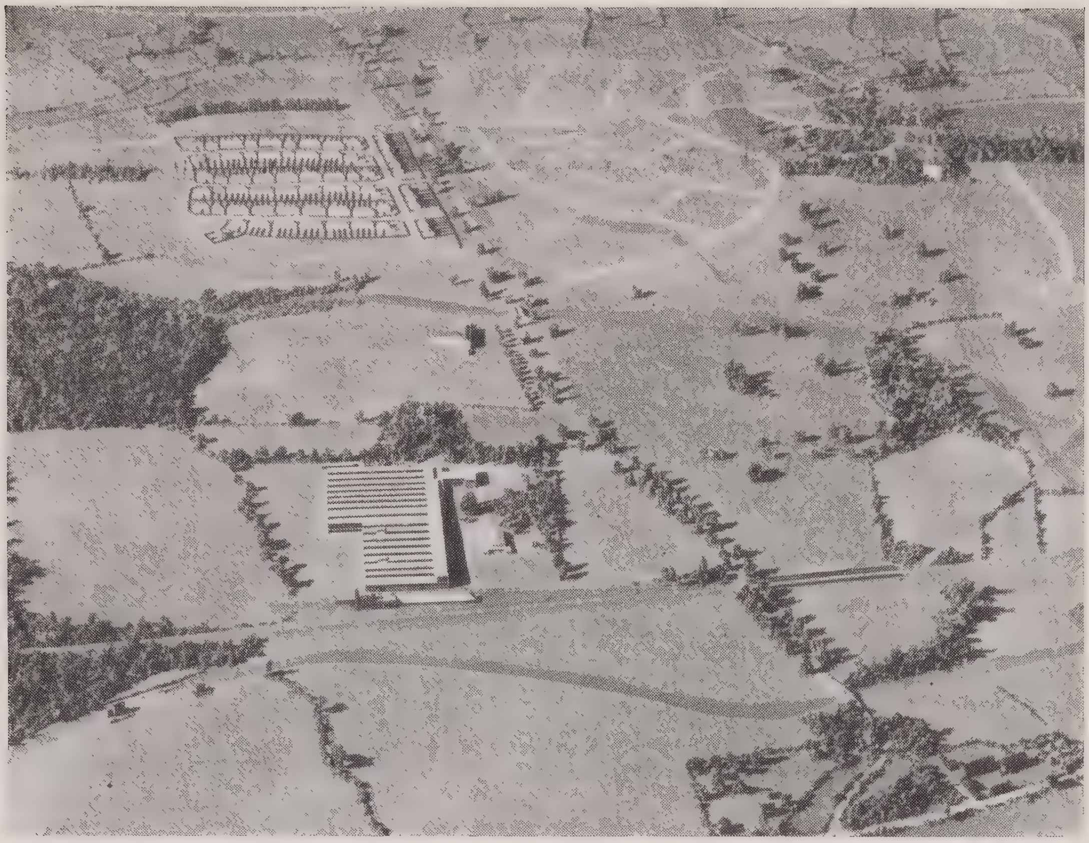
" It may be assumed," he continued, " that any national fuel scheme would visualise ultimate abolition of smoke from the atmosphere. At present we know that the damage caused by smoke is costing the community an annual sum of money running into millions of pounds sterling, not to mention the damage to human health. When the day arrives that no smoke is emitted into the atmosphere, these annual millions of money will be saved, and in the intervening period of time will be a gradually declining quantity. Is it not possible to capitalise this heavy annual expenditure to assist the balance sheet of any proposed national fuel policy ? "

Mr. Troup illustrated this by quoting figures showing the heavy cost of smoke to the inhabitants of our large towns.

Putting the Policy into Action

Declaring that no definite movement towards a national goal could take place

(*Concluded on page* 21)



A
SMOKELESS POTTERY

Wedgwood's Notable Development

THE famous firm of Josiah Wedgwood and Sons, Ltd., have recently transferred their headquarters from Etruria to Barlaston, on the south side of Stoke-on-Trent. Here a new model factory has been erected in the rural Barlaston Hall Estate. Plans have been made for the building of a village and for a school and shopping centre, and for the provision of playing fields. Nearby, overlooked by the village, are a string of pools, twelve hundred yards long, which will give facilities for fishing, boating and bathing.

The photograph above shows a model of the estate, with factory and railway in the foreground, and the first village site towards the left at the top. To the right of this is the layout for the future housing estate, and beyond this, surrounded by trees, is Barlaston Hall. The school is shown between the village and factory.

The initial factory, now complete and working since October last, houses the " Queensware " section of the firm, but the major part of the china section will have to remain, owing to war-time building restrictions, at Etruria for the present. The same conditions have prevented the completion of the village, although some of the houses shown on the model have been completed and are now occupied.

Why the Move was Made

It will be of particular interest to our readers to know why it was necessary to make the move from Etruria. Joseph Wedgwood moved his works from Burslem to a more rural district in 1771, and built both the pottery and the village of Etruria. This area is now dominated by coal mines and ironworks. Mining subsidence had caused the works to sink about seven and a half feet, and the polluted atmosphere was detrimental to the manufacture of the pottery. The loss caused by ware becoming specked with dust from nearby industry was amounting to approximately £3,000 a year.

This, incidentally, is to us a new and not insignificant example of the way in which air pollution impedes and adds to the costs of manufacture.

Main Street runs the length of the top deck of the factory.

The New Factory

The main factory block is 680 feet long by 150 feet wide, and the buildings are nowhere more than 35 feet high.

The principal feature, from our point of view, is that the firing of the ware at Barlaston is entirely electrical for all of the three processes of biscuit, gloss and enamel. It is the first all-electric pottery in the country, and the development was quickly found to be successful.

The Biscuit and Glost Kiln is 273 feet long. It is a two-way tunnel, firing both Biscuit and Glost up to 1,200 deg. C., and is the first electrically-fired kiln for this temperature to be installed in this country.

Owing to it being electrically-fired, both Biscuit and Glost ware can be placed in the open without the use of saggars (cases of baked fireproof clay enclosing pottery while it is baked). A passage underneath the kiln provides facilities for dealing with a kiln jamb, without shutting down firing, and the roof of the kiln is arranged so that heating elements which fail can be withdrawn and replaced while the kiln is still in operation.

The factory has been built on a rising site, so that it has been possible to have three floors at the Sliphouse, two floors for the adjoining pottery shops, and one floor of the warehouses and decorating shops. Alongside the decorating shops is situated the electrical enamel kiln.

The Boiler House

The only chimney on the factory is the boiler chimney, and the boiler plant has been designed with a flue-gas washing plant to assist the prevention of smoke and grit emission. The original intentions have probably been impeded by the present abnormal conditions.

A power house equipped with turbines supplies electrical power to sliphouse, pottery shop, and enamel kiln, while the power for the biscuit and glost kiln is supplied from the grid by Stoke-on-Trent.

Amenities Preserved

The estate comprises 381 acres, of which sixty have been reserved for industrial purposes, 160 for the Garden

A truck of clay about to enter the kiln for biscuit firing in the electric kilns.

Village, and the remaining sixty are to be retained permanently as open spaces of parkland, woods and playing fields. All the amenities of the old Barlaston Hall estate have been carefully preserved, including a famous avenue of trees leading up to the Hall.

The technical aspects of manufacture, layout, the handling and transport of materials, choice of equipment, and so on, were most carefully studied before the new enterprise was started, and visits were made to practically all the important potteries on the Continent and in America.

The new factory may be looked upon as the most modern and advanced of its kind, and fully consonant with the great traditions of the firm. It will be particularly gratifying to those concerned with smoke abatement to find that such a notable development brings in its train a full measure of smokelessness, for the problems of pollution arising in the clay industries have for long been among the most difficult of all industrial problems. It is excellent that one of the most famous names in ceramics should have shown the way to the new era of clean and healthy industry.

We are indebted to Messrs. Wedgwood and to the *Pottery Gazette and Glass Trades Journal* for the information given in this description, and to the latter for their courtesy in loaning blocks for two of the illustrations.

POST-WAR NATIONAL FUEL POLICY—*concluded*

until the full weight of authority was behind the movement, Mr. Troup urged that a plan be devised by the co-operation of the authorities in each branch of activity concerned with fuel problems.

He proposed that in the initial stages a small committee be formed by representatives of each of the Institutions more directly concerned with fuel problems, which would consider the problem from the point of view of a skeleton plan. Then stage by stage a more representative committee could be built up embodying the authorities of the major activities of our technical, industrial, and commercial life.

" The Institute of Fuel," concluded the paper, " would seem to be the natural starting point for such a movement, and these notes have been compiled to give an opportunity for ventilating ideas and opinions on the subject of a national fuel policy, the drafting of which calls for teamwork covering a wide range of problems."

A MAN IN THE STREET AND SMOKE ABATEMENT

By Edward Richardson

(The member who sent us the following article says " It is meant to be controversial and polemical, to enliven the normally staid pages of ' Smokeless Air,' and if it provokes criticism—I'm quite used to that." So if this account of trial and trouble provokes some of our friends to the extent we think it might—let us have some criticism of equal frankness.—Editor.)

LIKE most people, I had heard of smoke abatement, but did not know what it meant and cared less, before I married in 1929. But I was keenly interested in saving work for my wife. Accordingly, we planned our house to be as clean and labour-saving " as possible." We paid the builder five pounds extra to lay gas to every room except the box-room, and insisted that the kitchen grate which he proposed should be replaced by a boiler to burn anthracite or coke and (as we then believed) rubbish. The house installation included a gas copper and we bought a gas cooker.

Next came our innovations. To the builder's mixed delight and amazement, we refused to let him make an elaborate plaster cornice in the lounge, which would harbour soot. We bought a gas poker, with some difficulty, and began our married life by boiling the kettle and frying on it, as our gas cooker had not been delivered and there was no other way of cooking. Gas fires were fixed in the dining-room and two bedrooms, and a towel-rail in the bathroom, heated from the boiler. We had read that for short periods of use gas-fires were more economical than coal, whilst for longer periods coal had the advantage. So we planned to have one coal fire only—in the lounge. Hence no cornice.

At that time the policy of paying for electricity on a basis of the rateable value of the house had not been introduced in our district, and we calculated that gas heating would be cheaper than electricity.

To-day, our maid remarks spontaneously that the lounge (coal fire) is the dirtiest room in the house. But we still burn coal in it, and have a pile of too-large lumps stacked in the garden, much of which will be wasted as dust when we come to smash them up. We have never found a coal merchant who would deliver the correct size every time.

We Abandon Coke

We have tried coke for our boiler, but gave it up because it would not keep in all night, because it took up too much room in the coal-house, because we were always buying it and could not get quick delivery, because it was often wet, and because we had to fill the boiler up about every half-hour with it. We also tried coke in the lounge, but abandoned it for the above reasons, and because we found that we must keep the fire very large, or it went out. Our grate is not one of those specially designed to burn coke.

We use anthracite in the boiler, finding it convenient in size and for storage, very efficient indeed, and confoundedly expensive. The boiler keeps alight for weeks at a time with the minimum of attention, and heats the kitchen, too. Our only complaint is the bill. This caused us to install an electric immersion water-heater, with thermostat, which we use in the summer instead of the boiler. This also is marvellously efficient and convenient, and moderately expensive. In twelve years we have only once had trouble with it, though that was fairly serious and new elements were required.

We Glory in our Gas-Poker

I have never chopped a stick since I got married. My friends all buy scrap wood (and now they can't get it) and take it home in their cars. They spend energetic week-ends chopping it. Our gas-poker does everything. Now that newspaper is difficult to obtain, we consider it worth its weight in—anthracite ! We still show it to friends, most of whom have even now never heard of such things. They admire it, but cannot imitate us as they have no gas-points in their rooms to which one could be attached. We are now using our fourth poker, for the metal burns away in time.

Gas fires in bedrooms are a luxury we can only afford in very severe weather or when there is illness in the house, but then they are invaluable. We now have an electric fire in the box-room, for our electricity is only a halfpenny per unit, plus the percentage on the rateable value. Were we starting afresh, we might have used electric fires throughout instead of gas, for they are silent, cleaner, and do not suffer constantly from damaged radiants. Gas fire radiants break of their own accord. They are also very easily broken, even when guarded, by children who knock them with toys, chairs or sticks. Yet I always imagine that the heat from our gas fires is less directional, and therefore more generally acceptable, than that from the electric one. And a post-card or telephone call brings a man from the gas company who investigates leaks, broken parts and any other difficulties so capably, and without charge, that we have a tender spot in our hearts for gas heating.

Smokeless Fuel

We have experimented with smokeless fuel in the grate. That is, we have on several occasions, over a period of years, made enquiries about deliveries. I believe we actually did get a sackful once, but am not sure. If so, we were not encouraged to go on using it. It is difficult enough to get coal and anthracite, even in peace-time, of the right size delivered on the right date, without going out of one's way to make one's dealer really angry by asking for smokeless fuel. We have tried for ten years to find a dealer who would deliver six hundredweights of anthracite to us on the first of every month without having to be reminded each month, but we have failed. At one time, we changed our dealer pretty frequently on this account. Imagine a milkman who insisted on your ordering your milk every day, or a newsagent who required you to telephone him every morning before he would send your paper!

Ideals to Aim At

I am now an associate member of the National Smoke Abatement Society, but we still sin with our one coal fire. Here is what I, and my brothers-in-the-street, demand before we become hundred per cent. abaters :—

1. Uniform and low electricity and gas rates. If I move to the other side of the city, I can pay as much as sevenpence per unit for electricity. Even at a halfpenny, electricity is too dear for me to use it for cooking.
2. A revolution in building. The builder must realise that the tiny cubicle coal-house he still provides is obsolete. Coke, anthracite and coal all get mixed up. Provision must be made for separate stocks of at least two fuels.
3. Either reduced anthracite prices, or more regularly delivered and better graded supplies of coke, coupled with *still larger* coal-houses and boilers which, though burning coke, burn for a week and do not need constant stoking. The " rubbish " they merely *consume*—it gives no heat.
4. Universal distribution and advertisement of smokeless fuels of the Coalite type, so that they are as easy and cheap to buy as coal.
5. The banning of the burning of soft coal in domestic grates. This will automatically stimulate the development of numbers 1 to 4.

I have vowed that if ever I can afford to build another house it will be centrally heated. Or else I shall save up my money and spend my old age in what is left of the south of France. In the meantime—one coal fire!

And I do seriously suggest that the Society commission a competent architect to design a modern coal-house, cheap enough to be adopted by the ordinary builder, with sufficient storage capacity for a variety of modern fuels. This should then be written up in housing and architectural journals and advertised as much as possible.

Thank You!

The Report (of the N.S.A.S.) makes good reading. It is a heartening document in these gloomy times, and it augurs well for the future of the Society, expressing as it does the fact that it is not to be deterred by difficulties and that it will carry on its useful work no matter what it has to face. There is no shadow of defeatism in the forward policy which it has decided upon.—*The Plumber.*

District Heating

A Solution to The Problem of Domestic Pollution

By S. G. Saunders,
A.M.I.H.V.E., A.M.I.E.C.

BY far the largest contribution to atmospheric pollution comes from the domestic consumer of raw coal. It is, therefore, to this field that architects, engineers and public authorities must direct their serious attention in the interests of our national economy and public health when planning for the post-war Britain. In this article it is intended to indicate, within the limitations of the space available, how the adoption of district heating may achieve these objects.

First let us consider the question—"What is District Heating?" In the author's opinion it can most aptly be described as the very important missing link in our present system of providing what are now recognised as essential public services, viz.: sewage disposal, electricity, gas and water supplies. It should be noted that the term "heating" includes both the warming of rooms and the heating of water for domestic ablution and other washing purposes. The first four services mentioned are all capable of being linked to that of heating in a co-ordinated scheme, as will be indicated in the text that follows.

Domestic Heating

Before proceeding further, however, it is desirable to review very briefly the present situation as regards warming and hot water supply in the average domestic household of the suburban type. Generally speaking, warming is restricted to one or, at the most, two rooms. Bedroom fires are as a rule rarely lit, and these rooms together with hall and landing usually represent the source from which cold draughts enter the living rooms to the acute discomfort of the occupants. This may appear a rather gloomy picture, but it is contended that it is fairly representative of the conditions under which the majority of our population spend their winter to-day. It is only necessary to ask the visitor from abroad his opinion of our winter comfort conditions to obtain an independent view on this—the reply is seldom flattering.

Taking the country as a whole, we have some 10,000,000 households using open fires, the latter totalling probably not less than 15,000,000 in all. Dr. Taylor, in his book published just before the war*, estimated that coke fire-grates were then being installed at the rate of about 150,000 per annum. It appears likely that this figure has fallen very considerably since the outbreak of war, but on the other hand, there has been a movement on the part of the Mines Department to encourage the use of smokeless hard Welsh coals for open fire use. The latter is a very welcome step in the right direction. The fact remains, however, that of the total number of fires only a relatively small proportion are using smokeless fuels. It is as well to bear in mind, moreover, that even with coke fires the sulphur content in the flue gases is not so very much less than when using a good quality bituminous house coal.

The situation in connection with domestic hot water supplies has undoubtedly improved enormously during the decade since the last war, and nowadays the provision of constant hot water is considered an essential feature of the modern suburban house. In the north this is generally provided by an open range, whereas in the south a small independent boiler designed to burn coke or anthracite fuel is installed in the majority of cases. This boiler is often made to perform the function of an incinerator for household rubbish, a practice that tends to provide an undesirable contribution to the pollution of the atmosphere.

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* *The Production and Utilization of Coke*, by F. M. H. Taylor, Ph.D., B.Sc., M.I.H.V.E.

Thermal Efficiency

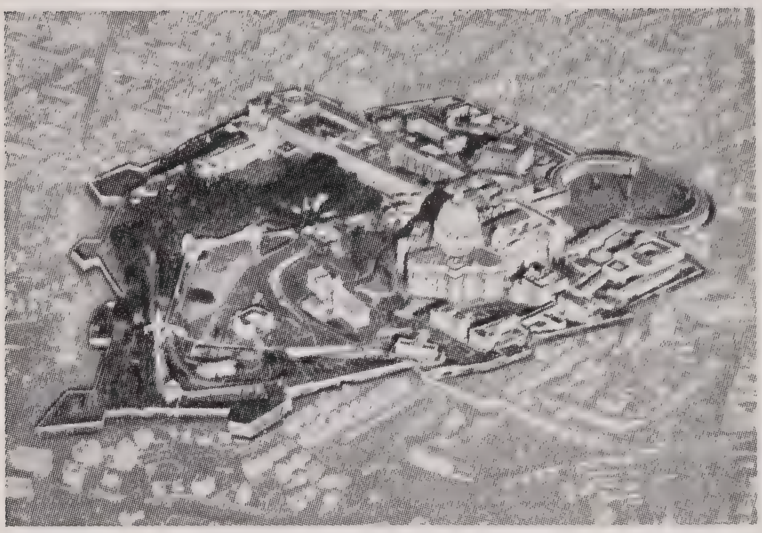
Coal used for open fires probably averages 1½—2 tons, whilst hot water supplies account for about two tons of coke per annum in the normal modern house of this type, comprising two reception rooms, three bedrooms and a bathroom, plus small kitchenette. The thermal efficiency of the open fire is only 20%—25%, and that of the domestic boiler rarely exceeds 50%—55%. Dealing with the first item, it is evident that by installing central heating throughout the house, including entrance hall, and employing a boiler which may be expected to average 65%—70% efficiency under hand firing conditions ; the additional warmth and comfort obtained will not entail such a greatly increased fuel consumption as would be the case if attempts were made to obtain similar results by the use of open fires.

Calculations show that for a house of this type the average hourly heat loss during the winter season is between 20,000 and 25,000 B.Th.U./hour. This figure is based on a mean external winter temperature of 42°F. and internal temperatures of 60°-65°F. in living rooms, and 55°F. in bedrooms and hall. In the writer's view, one open fire designed to burn smokeless fuel of low sulphur content should be retained in the main living room as an auxiliary to the central heating system. The latter need only be designed to provide a temperature of 55°F. in this room, the fire being then lit to bring its temperature up to the usual 60°-70°F. when necessary. On mild days it would not be necessary to use the fire. The average Britisher regards his fireside as an essential feature of home comfort, and on these psychological grounds attempts to introduce central heating without retention of at least one open fire are certain to meet with great opposition. There is a good case, however, for omitting fireplaces in the remaining rooms, as the cost of construction will be materially reduced ; the saving on this account being a definite contribution towards the cost of the heating system. The absence of fireplaces in these rooms would frequently enable better use to be made of the space available. The average winter heating season covers a period of 200 days, and allowing for banking at night the annual fuel consumption of central heating system, with intelligent operation, would be approximately four tons ; to this must be added the smokeless fuel required for one open fire—probably half to threequarters of a ton.

Thus it will be observed that even with an independent plant in each house greatly improved comfort conditions could be obtained for an additional expenditure of only about three tons of fuel per annum, accompanied by a great diminution in domestic pollution. The cost of installing a radiator system would, under pre-war conditions, be about £75-£100, and part of this would be offset by a reduction in building cost due to omission of fireplaces and flues.

Now let us consider the question of fuel consumption if each of a considerable number of houses were supplied with heat from a central source, in the form of steam or hot water, distributed through pipelines laid under the pavements ; this constituting what is now referred to as " District Heating." In the first case, it should be noted that the district boiler plant could, with reasonable certainty, be operated at an average efficiency of at least 80%. The fuel consumption to meet the total internal heat requirements of each house would, therefore, be reduced from the previously quoted figure of seven tons to about five and a half tons. To the latter must be added the consumption due to heat losses from the distribution mains. This will naturally vary with the layout and density of load. A fair average for this loss is 10%, say half a ton, bringing the final figure to a total of six tons per house per annum. By the use of large and suitably equipped boiler plant it would be possible to burn lower grade fuels and this, coupled with bulk purchase of large quantities as against individual purchase by every householder, would obviously reduce the total fuel bill by no inconsiderable amount. Most important from the smoke abatement point of view, combustion of the fuel can be rendered smokeless and the flue gases cleaned by either washing, electrostatic precipitation or other methods in accordance with the best modern practice. It would be perfectly feasible to locate these plants outside the residential areas, and it is reasonable to expect that the ultimate development of such schemes will see whole towns heated from large external stations.

There are no serious technical difficulties involved in the conveying of heat



Vatican City has District Heating

to such distances, and the losses incurred are proportionately no greater than the equivalent losses on electricity, gas and water supply services. Many plants abroad are conveying heat over distances of two to three miles, and have distribution systems varying from ten to sixty miles or more in length. In Russia in particular, great strides have been made in the development of district heating schemes during the last ten years. The reader who wishes to acquire information on the growth of district heating in that country is advised to read the review of developments there, by Mr. A. E. Margolis, in the *Steam Engineer* issues of February and March, 1941.

Generally speaking, it may be said that the supply of heat by district distribution has, so far, shown a definite tendency to be restricted in all countries to the larger buildings and industrial premises. This is bound up with the question of providing a sufficiently large load on a particular main to render the cost of installing the latter and supplying the heat an economic proposition. The same considerations apply, of course, in connection with the other public services with which we are now so familiar.

Use of Waste Heat

In the writer's opinion the real solution to this problem lies in combining the generation of heat with that of electric power and of making greater use of the other available forms of waste heat. The most up-to-date electric power stations in this country have an overall thermal efficiency of not more than 25%. The efficient use of the heat at present removed by the turbine condensers and dissipated in our waterways would raise the figure for combined heat and electric stations to around 80%—less distribution losses. It is *here* that the opportunity to conserve national fuel resources lies. Notwithstanding the great contribution that the increased use of electricity has made to the improvement of our general standard of living and smoke abatement, it must remain a matter for regret that the development of the electric grid has proceeded so far without regard to the question of waste heat utilisation. The fact that in the case of only one of the large London power stations, which consumes about 1,000,000 tons of coal per annum—the heat equivalent of at least 500,000 tons is thrown into the Thames every year, cannot be lightly dismissed from the mind. The total fuel loss in this direction for the present grid scheme must be in the region of 7,500,000 tons per annum, and if we include all the electric power stations in the country, many of which have lower overall thermal efficiencies, the total is obviously even greater. It is worthy of note that in Russia the combination of heat and electric power generation and distribution has been accepted as an essential feature of economic planning, and in that country the term " heatification " is now part of their engineers' vocabulary.

As an indication of the quantity of waste heat available from this source, reference to the records of the various electricity undertakings in this country shows that the consumption per head in suburban areas averages around 300 units per annum. On this basis we find that from the consumption of a four person household the recoverable waste heat, allowing for an overall thermal efficiency of 25% in electrical generation, amounts to approximately 20,000,000 B.Th.U.s per annum. This figure would be sufficient to provide very nearly all the annual domestic hot water requirements of the household or, alternatively, it can be stated as being sufficient to deal with about 30% of the winter warming requirements throughout the house. The figure of electricity consumption taken above is a reasonably conservative one. The tendency will undoubtedly be for it to increase in proportion to the growing tendency on the part of the public to increase their use of labour saving electrical equipment of all types.

Other Sources of Waste Heat

In addition to the recovery of heat from electric power stations there are available as waste heat products of the residential area other sources of potential heat and power generation, viz.: refuse and sewage disposal.

In the properly planned district heating system recovery of heat from incinerator plants should, and must, take its place in the co-ordinated scheme. A number of local authorities have been generating electricity as a by-product of their refuse destructor plants for some years with considerable success. By linking to this source of heat production the district heating system, it will be found possible to utilise to a maximum the available heat output. The latter generally takes place on a fairly constant rate throughout the day, a feature which does not always lend itself too well to serving electric power generation alone, with its variable hourly demand. The addition of the district heating system would smooth out the peaks and valleys in the load curve; the domestic hot water supply services with their storage cylinders providing an admirable thermal storage system throughout the year. The average weight of refuse collected per head in normal times amounts to about 2 lbs. per day, and if we assume that only half of this is disposed of by the destructor plant the heat recovered would amount to about 2,500 B.Th.U.s per head per day; sufficient in the four person household to provide ten gallons of hot water at 140°-150°F. for domestic purposes.

The question of utilising the potential heat supply of sewage treatment plants, employing anerobic fermentation treatment (or "digestion," as it is more frequently described) of the sludge, for heating purposes external to the plant is one which, so far as the writer is aware, has received little, if any, consideration. With this method of sludge treatment gas of relatively high calorific value (650-700 B.Th.U.s per cubic ft.) is evolved, and this can be collected and used as a fuel with engines and boilers of conventional design. Usually, a proportion of the gas available is utilised for heating the sludge, to improve its rate of digestion and for generation of electric power to meet the internal requirements of the sewage station. Most plants in this country are at present producing about one cub. ft. of gas per head per day. At this rate of production the balance of potential heat available, in unused gas and recoverable waste from the cooling and exhaust systems of gas engines, ranges between 200 and 400 B.Th.U.s per head per day, dependent on the time of the year. It may be observed here, however, that many plants of this type abroad are producing between two and three times this quantity of gas per head. It is reasonable to assume that if a demand for maximum gas production is created, modifications to the design and method of operating these plants would enable increased yields to be obtained. An increase to only two cub. ft. per head per day would make available about 4,000 B.Th.U.s per day from the four person household.

Summarising the foregoing figures we find that the potential waste heat available from a four person household would amount annually to approximately :—

	B.Th.U.s
Electrical generation	20,000,000
Refuse destruction	4,000,000
Sewage plant*	1,000,000
Total	25,000,000

* (allowing about 50% increase only in present average yield of gas).

This is equivalent to around 20% of the total fuel requirements for the house when connected to a District Heating station. As stated, the probable tendency would be for this figure to increase, and it is reasonable to visualise conditions under which, by utilisation of waste, complete heating of the whole house will be obtained without any increase in the present fuel consumption figures, and furthermore, with considerable reduction in the cost of the fuel used.

Considering the finance of the District station—it can be stated that the cost of electrical generating equipment would be reduced. Back-pressure turbines, which are cheaper than the usual condensing type, would be installed to meet the winter heat requirements. The condensing equipment would then need to be only sufficient to cope with excess heat production during the summer, and boiler plant output would be reduced in proportion to the heat available from refuse and sewage, with consequent reduction in cost. The cost of refuse destruction and sewage plants would be virtually the same whether or not combined with the central plant, but by locating these various plants together a reduction in building and operating costs would undoubtedly be affected. It is evident, therefore, that the cost of providing additional plant for heat generation to meet the balance of winter requirements, waste heat recovery from refuse and sewage, also flue gas cleaning, would receive a substantial contribution from the savings effected in the cost of plant, buildings and operation, obtained by co-ordinated planning on the foregoing lines.

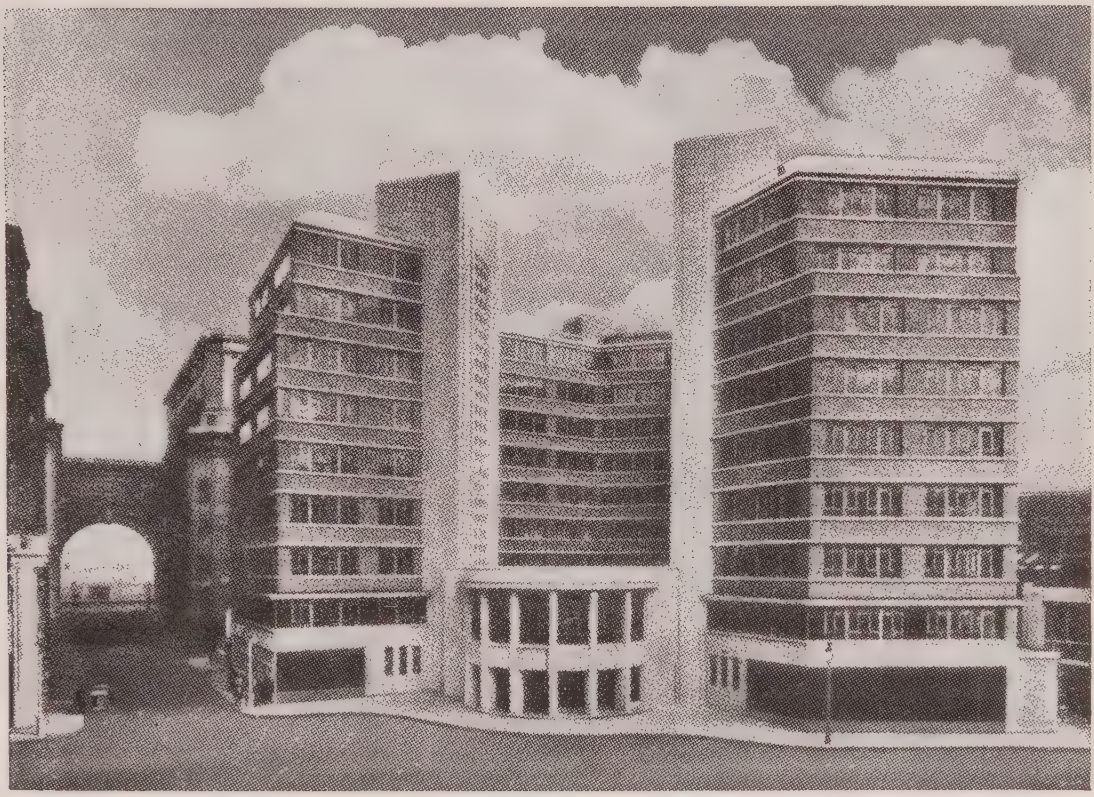
The Use of Gas

In areas where gas is available at sufficiently low rates there is no reason why this should not be piped to the central boiler plant, and either a proportion or the whole of the latter equipped to utilise it. At pre-war rates it would be necessary to purchase the gas at 1d. per therm, in order to compare with mechanical coal firing at 25s. per ton on a basis of heat purchased ; the efficiency of combustion in a large station being about the same for each.

The use of gas would, however, enable considerable savings to be made in the cost of the station equipment by obviating the necessity for fuel and ash handling and storage, items of no small magnitude in a large plant. Smokeless combustion would be assured and treatment of the flue gases would be less costly than with solid fuel. Labour costs would also be reduced. Taking these savings into account, gas at between 1½d. and 2d. per therm would prove an economical proposition. At this figure there should be a considerable scope for the use of colliery-produced coke oven gas, where a supply is available within an economic distance from the station. The future development of gas grids may well raise the economic distance stipulated to a relatively high figure. Indeed it is not unreasonable to look to the day when the bulk of gas used will be produced in carbonising plants situated within the coalfield areas and piped to other parts of the country to meet the needs of the population.

The foregoing presents but a general picture of the problem of domestic pollution and the possibilities of District Heating as a solution. It is evident, from a consideration of the factors involved in the co-ordinated scheme outlined, that the guidance and lead in planning must come from a Department that is in a position to deal with the issues from a national viewpoint. Most important is the necessity of the Department concerned having the authority to deal effectively with any obstructions that may be put in the path of progress by individual or other interests. We have the greatest opportunity ever presented to us for rebuilding and creating a Britain in which atmospheric pollution, with all its attendant evils, will be banished from the homes of its people. Then indeed will Wordworth's words and the ideal of *Smokeless Air* prove a realisation instead of, as at present, mainly a hope for the future. That opportunity should not and must not be lost.

The smoke problem from the airman's point of view has been frequently discussed, but for the first time we read of the use of aircraft for smoke emission observations. Not in this country, of course, but in Cleveland, Ohio, from where it is reported that " Safety Department inspectors will use airplanes in an attempt to eradicate Cleveland's increasingly serious smoke nuisance." The locations of heavy contributors of smoke, and pictures of smokestacks in operation, were to be obtained by an aerial survey. " If this initial attack from above proves successful," said Safety Director Eliot Ness, " airplanes will be used by the department as a practical enforcement method." It is good to hear of a beneficial form of air attack !



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SMOKELESS AIR

The Smoke Abatement Journal

Wartime Issue No. 8 **Summer, 1941**
(Vol. XII., No. 46)

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Smokeless Air

COMMENTARY

A Smokeless City

OUR *Smokeless Air* photograph above is a happy picture from one of the last capitals of Europe to retain some measure of peace—Stockholm. Like most other continental cities it is, at least in comparison with our own towns, clean and smokeless. The need for efficient heating in the winter months makes the open fire unsuitable, and housing in Stockholm has in recent years been far-seeing and progressive—the kind of outlook that needs encouragement in our own planning of this country's post-war housing drive. There has been a building of both cottage homes, each separate and with its own good-sized garden, on the outskirts of the city, and modern flats within the city itself. The cottages show only one central chimney, and are all equipped with stove or boiler, supplying heat through radiators and hot water from the one fire. The flats are also smokeless, and it is a matter of policy to equip them with all conveniences that help to take the drudgery out of housework and give the housewife more time to devote to the care of the children and the preparation of good food for the family. Heating payments work out at less than 5 per cent. of the average wages earned.

An Exhilarating Resort

We are indebted to Mr. Donald V. H. Smith for this information, culled from his informative booklet, " New Homes for Old," and for the above photograph and that of a Paris housing estate on another page to him and to Ideal Boilers and Radiators Ltd. " Stockholm," writes Mr. Smith, " is an industrial city—but has been made, and is kept, not merely a city fit to live in, but as well an exhilarating resort for a holiday. Imagine anyone describing our manufacturing towns as such ! "

" A most pleasing feature in all the city flatted housing schemes," he adds, " is the large amount of ground available as gardens and playgrounds. There are no density regulations, yet with a population of over 320 per acre in one scheme, less than one-fifth of the site is occupied by buildings, and, exclusive of roads, nearly 60 per cent. is available for open spaces and gardens."

District Heating

A report of a recent paper by Mr. Smith on District Heating is given on another page, together with a letter from Mr. A. E. Margolis. We are glad to be able to draw attention to this method of preventing smoke by the merging of individual heating units into one big and more efficient central plant, and are sure that our readers will be glad to have this question more fully discussed. It is curious that such a rational form of development should have advanced so far in many cities on the continents and in the U.S.A., and yet remain virtually unknown in this country. If it has been because planning the heating of an entire area, instead of by separate and un-related buildings, was too big a job, then there is now an opportunity for creating a new attitude in the planning of reconstruction. We now *have* to face a large-scale rebuilding, and though the Society holds no brief for any one system as compared with any other, there does seem to be a strong case for a close investigation of the introduction of district heating on a substantial scale. It is a task for those responsible for town-planning, and also, it may be added, for those who will, it is hoped, bring about a better direction of the ways in which our fuel supplies are to be utilised. The time may come when individual boiler plant for central heating systems will seem as absurd as would individual power stations or gas works.

Women and the Future

The article on domestic smoke abatement in our last number was contributed by a " *man* in the street," and the only comment received for publication about the questions raised is also by a man. Yet, of all subjects, the heating of the home, and its protection from the nuisances caused by smoke, is one that should be discussed by women. The housewife, with her needs and her prejudices, is one of smoke abatement's biggest problems, and she has a right to give her views and to help us to formulate our policies. The Society has many women members and a number of the representatives of the affiliated local authorities are women. We are glad to have their support, but we would like them to help us more actively, particularly in relation to the province in which they are most deeply concerned—the home.

A circular letter has been sent to all women members and representatives, announcing the inclusion in our next number of a symposium on " The Homes of To-morrow : the Woman's Point of View," and inviting them to send short contributions to this. It will be a feature entirely by—but by no means entirely for—women. Copies of this letter will be sent on request to other women who may read this paragraph, and to men who may wish to persuade their womenfolk to let us have their views. We do ask for a good response so that this may be a particularly enlightening feature of our next issue.

The Acid Pest

We frequently quote from *Smoke*, the bulletin of the Smoke Prevention Association of America, and *Smoke* frequently quotes from *Smokeless Air* (a kind of mutual lease-lend arrangement). In a recent issue our friends take the following extract from the popular magazine *Life*, under the headline " Acid Particles Eat Holes in Washingtonian's Hose " :

" In Washington, D.C., on March 18th, mysterious forces reopened their attack on the threads of sheer silk and nylon stockings of outraged Washington women for the ninth time in a month. No female was safe. Secretaries, stenographers and sales girls trudged off to work in the downtown area with immaculate hose, arrived at their offices with as many as 25 runs per leg. Discovering that these attacks took place only on windy days and that ruined stockings contained particles of sulphuric acid, the District smoke control office blamed improper fuel combustion. Inspectors are now searching for offending chimneys."

We hope that they quickly find such ungallant offenders. That the acid particles of smoke are responsible for much damage to textiles is, of course, well-known in this country (curtains after heavy fog or in the cities generally tell their own story), but before this we had not heard of *blitzkrieg* methods of attack. That stockings should weaken, and develop runs, more quickly in a polluted atmosphere is very probable, but that it should all happen on the way to work in the morning seems to show an unpleasantly high concentration of acid. Or an unusually spiteful variety. Perhaps our women members, who have just had another request made to them, may be able to comment on this report from their own experiences of the rate of wear of silk stockings in town as compared with country. We may, before we finish, be able to estimate the cost of smoke in coupons lost per annum.

Are you a Swell Guy?

" In spite of political promises, ' if ' money, welfare, social experiments, and other much advertised panaceas, we still need your help. How about it? Have you a photograph, a cut or article or an idea that we can use in the Bulletin? Some of you guys have been swell—and some of you lazy bums haven't helped a bit to get out your own Bulletin. Thanks to the swell guys—and why don't you others reform right now and give us some action ! "

This is how the quite serious journal of a technical association in the U.S.A. appeals to its members for their help in producing a bright and useful publication. We are tempted to ask for similar assistance in the same bluff way, but as a contributor to our last number suggested, we seem to be too staid. But all the same, anything of interest that readers can send will be most welcome. Particularly news paragraphs and other items, and also photographs and suggestions or new ideas for articles and features. It isn't too easy, these days, compiling each quarter a magazine that will keep strictly to its appointed job and at the same time contain nothing that is not of real interest and value. We are sure that you, reader, are at heart a swell guy. So what about giving us some action?

THE DEFENCE BOND FUND

We print below a first list of acknowledgments of contributions to the Society's new Defence Bond Fund. It is disappointingly brief, and we hope that a second list in our next number will be more representative and much longer. We know that there are difficulties—and increasing ones—in the raising of a fund of this kind, especially when we have been careful to explain that we do not wish contributions to prejudice the continuation of the ordinary annual subscriptions.

We do not care to have to appeal for money, and editorially rather disapprove the use of *Smokeless Air* for such a purpose. But it is an exceptional purpose, and the Society would not be fulfilling the task for which it was formed if it was not now looking ahead and becoming anxious: not anxious about its ability to survive present and future stresses, but about its ability to make the fullest use of what may be its biggest and *shortest* opportunity for promoting clean air. Smoke *prevention* in reconstruction will be infinitely better—and cheaper—than smoke *abatement* ever after.

Copies of the folder describing the Defence Bond Fund in detail are still available and will be sent on request.

FIRST LIST OF DONATIONS

	£	s.	d.
The Society	200	0	0
Will Melland	50	0	0
Redditch Gas Company	10	0	0
Miss H. M. Barnard	5	0	0
Charles Gandy	5	0	0
Stockport Gas Committee	5	0	0
The President	3	3	0
Kingston-upon-Hull Corporation	2	2	0
A. Hancock	2	0	0
J. Prest	2	0	0
Miss R. L. Gandy	1	1	0
E. F. W. Maclaverty	1	1	0
Allan W. Ritchie	1	1	0
G. C. Marshall	1	0	0
Miss Agnes Fry	1	0	0
B. S. Lister	1	0	0
Miss A. Ruth Fry		10	0
S. K. L.		2	6
Total, to July, 1941	£291	0	6

THE REBUILDING OF BRITAIN

A review and continuation of the recent discussions by the Chairman of the Society's Executive Committee

The earth is beautiful in the extreme in places where nobody lives, but in places where people have decided that they wish to live in large numbers together for social purposes, for business purposes, for convenience of all kinds, there they have taken no precautions to keep the earth beautiful, there they have made it ugly, there they have spoilt the face of the earth.—**Sir Oliver Lodge.**

There can be no doubt that smoke and noxious vapours have a highly injurious effect on vegetation and on agriculture generally.—**From the Interim Report of the Departmental Committee on Smoke and Noxious Vapours Abatement.**

The abolition of smoke from our midst would do as much for the improvement of public and individual health in our industrial centres as any other single action open to this country.—**Dr. R. Veitch Clark, Medical Officer of Health for Manchester.**

Merely to burn coal as we do now, especially in the domestic grate, is a crime. If the enormity of the offence is not yet understood by the people, at least the chemist realises its importance.—**Dr. E. F. Armstrong, Past-President of the Society of Chemical Industry.**

ALMOST without our noticing it the smoke abatement movement has entered a new phase. It is no longer the pioneer movement of half a century ago, when the now President of the National Smoke Abatement Society and other far-sighted men first gave organised and scientific direction to London's wish to end the ever recurring smoke fog, nor the merely educational movement of the early decades of the present century. The quotations heading this article (save perhaps the last) are no longer the startling utterances of men who have given exceptional attention to the subject, but fairly represent the general feeling that was already prevailing before the present war, a feeling which was expressing itself in demand for action. The demand is not merely that every citizen, wherever he or she works, should have the opportunity of a home in clean healthy air and pleasant surroundings. We have attempted that already, by building our private houses and our housing estates at ever-increasing distances from centres of employment, adding always to the daily journey to and from work, to the extent, cost and complexity of sanitary and other services, of roads and transport, as the dinginess or vulgarity of town, like an invading army, encroaches ever more deeply on the countryside.

The demand is rather to reverse this process, to mobilise the energies and resources of our civilisation, to bring again clean and healthy air, and something of the loveliness of nature, into the heart of our cities, so that they may once more be places desirable and delightful to live in, and not only to run away from.

It is indeed impossible to think of the immense task of post-war reconstruction without reference to the problem of smoke. This is well shown by the distinguished contributors to the discussion in the last issue of this Journal. As stated by Alderman David Adams, M.P., " the smoke plague is as unnecessary in this era as overcrowding, slums, and poverty," and by Sir Francis Fremantle, M.P., " the possibilities of a smokeless atmosphere, especially in the areas to be replanned and rebuilt, and any new areas to be developed, are not mere dreams of beauty, but are practical certainties."

Practical Measures—Three Aspects

A consideration of the practical measures to be adopted falls naturally into three parts, according to whether our attention is directed chiefly to the fuel used, to the apparatus for its combustion, or to the products of combustion escaping to pollute the neighbourhood. Our thoughts may turn primarily to the coal-house, to the fireplace, or to the chimney-top. The first of these is the province of the fuel technician and of the electrical, gas, and low temperature carbonisation industries, the second that of the architect and engineer, and the third that of the public health officer and police court. All are related to the more general problems of reconstruction and of town and country planning

Considering first the fuel to be used, we find a growing conviction that there should be a National Fuel Policy in respect of the coal resources of the country, and especially those used in the home market. It is still true, as was stated by the Samuel Commission after the last war, and emphasised in a paper recently read before the Institute of Fuel by Mr. John D. Troup, that " no comprehensive survey has been made of the heat, light, and power requirements of the various industries, or of the country as a whole."

The making of such a survey following the present war will be facilitated by the war-time machinery of registration, and in order that the necessary statistics may be made out it has been suggested that all consumers of solid fuel, whether for industrial, business or private purposes, should register with one or more suppliers, and that no such fuel should be supplied without a licence and the obligation to make the necessary returns to the Department concerned with the survey. Such a survey should not, I think, have any ulterior motive to coerce people into using one kind of fuel rather than another. Its sole purpose should be to gather reliable information as to the country's needs and resources, and so to assist existing and future efforts for the better use of the latter; to be a storehouse of information and advice on the availability of various types of natural and artificial fuel and the requirements of the public, leading to the better siting and distribution of coal utilisation plants, electricity and gas supplies; and by disseminating information to encourage a wiser use of fuel by the public generally.

The survey should link up with a considerable expansion of the important work already being done by the Fuel Research Board, the Coal Utilisation Joint Council, the Atmospheric Pollution Committee of the Department of Scientific and Industrial Research, and other bodies, including the Regional Smoke Abatement Committees and Local Authorities.

Some critics would go further and suggest, like Professor Reilly, a tax on the burning of untreated coal, or like Miss Marion Fitzgerald, the ultimate prohibition of its use in open grates. Personally I should prefer to retain the fullest liberty for consumers to choose whatever fuel they may prefer. A tax on raw coal, particularly while no sufficient smokeless substitutes are available, would bear heavily on the poorer classes of the community, who depend mainly on solid fuel.

Control of Appliances

The second method of smoke control, i.e., that of the apparatus used in the combustion of fuel, also finds many advocates. It is already provided by Section 5 of the Public Health (Smoke Abatement) Act, 1926, now replaced by section 104(2) of the Public Health Act, 1936, that building byelaws may require the provision in new buildings, other than private houses, of such arrangements for heating and cooking as are calculated to prevent or reduce the emission of smoke. Unfortunately, it has not been found possible to make any such byelaws, defining with sufficient accuracy the nature of the arrangements to be provided. Even if such byelaws were made and applied to all such new buildings, there would be difficulties of administration, and it is hard to see how the owners of fireplaces suitable for the burning of smokeless fuels could be prevented from using them for the burning of fuels which produce smoke. Unless otherwise prevented, they will tend to do this so long as raw coal is cheaper and more easily obtained.

There is, however, no doubt much to be said for the control of heating and cooking arrangements in new buildings, and this would probably be best carried out by requiring building plans to show such arrangements and to be passed by a qualified combustion engineer.

The most effective use of control in relation to new buildings would, however, be in connection with a system of zoning, and the suggestion of Mr. James Law, Chief Smoke Inspector of the Sheffield, Rotherham and District Smoke Abatement Committee, that Town Planning Committees should have at least one member capable of advising and assisting in matters of combustion appliances and that there should be complete zoning in respect of residential areas, central areas, light industrial areas, and heavy industrial areas, is particularly interesting.

Such complete zoning could not, of course, be done too hurriedly, and in areas already built up its effects might not be immediately felt. It would, however, especially if combined as he suggests with Regional Planning, be of the greatest value from the point of view of smoke abatement.

In the case of central areas, and of new light industrial areas, smokelessness could be assured immediately ; in the case of residential areas, and areas already built up but zoned for light industry only, this could be done progressively, as the supplies of smokeless fuels improve ; while heavy industrial areas could to an increasing extent be segregated, and they, too, could be the subject of progressive improvement. Such zoning would not only speed the development of the electric, gas and smokeless fuel industries, the modernisation of much industrial plant, and the greater use of smoke preventing apparatus, but would be most important as an aid to efficient and helpful smoke inspection.

Control of Observation

The third method above mentioned, that of observation of chimneys for smoke emission, is well established so far as regards industrial smoke ; a " smoke nuisance " being a punishable offence under the Public Health Act, 1936. It is true that administration varies in different localities and offenders are not always brought to book, but the knowledge and tact of the inspectors under the more active authorities, and particularly where regional control has been adopted, have often been effective in winning the co-operation of industry, and reducing the need for legal action. Smoke from non-industrial sources is, generally speaking, quite uncontrolled by law. Of many reasons for this, one may be found in the lack of sufficient smokeless substitutes for the fuel required, another is the difficulty of supervision. While it is comparatively easy to spot the offending chimney of a large factory, it is obviously very different where the chimney is one among the many thousands in office buildings and private dwellings. Yet the smoke from such chimneys is of a more injurious nature to health, architecture and vegetation than industrial smoke, since owing to the lower temperature of combustion it contains a greater proportion of tars and acids. In any adequate scheme of reconstruction something must certainly be done about it, and here again the solution lies, I think, in the zoning principle.

Smokeless Zones

In May, 1938, a suggestion was put before the Public Health Committee of the Manchester City Council that an experiment in the control of non-industrial smoke should be made in a limited area of the city. It was suggested that the central area should be selected for several reasons, some of which may be worth while to recapitulate:

(1) The majority of premises in such an area, i.e., large modern blocks of

offices and commercial premises, are already equipped with smokeless apparatus.

(2) Smoke emission from a city building where old-fashioned coal fires are still used is very heavy, smoke often being emitted from every chimney and coming from a score or more of private offices.

(3) To occupy for business purposes the central area of a city is in itself a privilege and has accompanying responsibilities.

(4) The cost of conversion would generally be very small in proportion to rent and rates. In such an area, especially after heavy bombing, there will be few houses occupied by working class people, and these could, if necessary, be excepted. Modern blocks of flats, if any, in such areas, can and should be smokeless.

(5) Central areas are densely populated during daylight hours.

(6) The adoption of smokeless methods by its leading citizens and the possibility of being able to walk through an area without a single smoking chimney would be of the greatest value as an example to others.

(7) Any scheme for the replanning of central areas should include the provision, near the city centre, of one or more parks or public gardens, and if possible, the planting of trees in connection with architectural features and in shopping boulevards, and this cannot be done successfully where there is heavy sootfall from adjoining buildings.

The proposal was not only approved by the Committee, but endorsed by many leading citizens, and was followed by a thorough survey of the area, undertaken by the Health Department, which proved it to be practicable. There is little doubt that similar proposals would be generally acceptable elsewhere.

As a factor in town planning the proposal has great advantages—it is simple, practical, adaptable to local circumstances, and capable of logical expansion. In an area where complete absence of smoke emission is the rule a policeman on his beat can detect an offender as quickly as an A.R.P. warden detects a defective black-out. It may well be that the gradual and voluntary extension of such " smokeless zones " in areas already built up, and in new building estates, leading logically to the more confident expansion of the various smokeless fuel industries, is the real key to the solution of the smoke problem. For that purpose the necessary powers must, of course, be conferred by Government on the authorities concerned.

The " Co-ordination of Interference "

Another interesting idea is that put forward by Mr. Agate, President of the Manchester Society of Architects, which he calls a " co-ordination of interference." We are engaged in a war for liberty, and have no taste for the kind of national life where " everything which is not forbidden is compulsory." It is, however, true that the kind of action we are now demanding from the Government does mean some interference of one kind or another with individual liberty. The real question is whether interference is lawful and necessary for the benefit of other individuals, or arbitrary and unnecessary. Individual liberty in a civilised community depends on the observance of our obligations to one another, obligations which when publicly recognised and enforceable are known as the law, and no liberty is more important to human life than the enjoyment of unpolluted air and light. People do not always like to be reminded of their obligations, when the result may be a disturbance of more or less settled ways of life, and as Mr. Agate suggests, the many interferences made necessary in a comprehensive scheme of reconstruction will be less objectionable to those affected by them if shown in their true light as part of a simple plan whose sole object is a happier and fuller life for all concerned. If this is to be achieved the art of publicity as well as courage and vision will be required in those responsible, and full use should be made of broadcasting, films, and other methods of informing the public of what is intended.

Lord Reith's insistence on boldness in planning is particularly welcome, for it has so often happened that for the sake of some minor economy or the appeasement of some comparatively

(*Continund on page* 42)

Smoke and the Householder

By J. Pickston, B.Sc.

I HAVE before me an enormous body of journals, press cuttings and reports on smoke abatement, and behind me a record of not altogether fruitless local campaigns, but there has been nothing more stimulating than the Society's war-time contributions to reconstruction propaganda. It is abundantly evident that smoke is not a mere flaw in our industrial and civic life, a tiresome addition to domestic toil, but the index of our national fuel policy. As a personal expression of opinion, this index shows an abuse and waste of natural resources, the cost of which outweighs the actual damage done by smoke.

Mr. Richardson's lively contribution of the householder's point of view tempts me to accept Mr. Marsh's invitation to criticism " of equal frankness." There are several points to make. The first is that I do not propose to insult the intelligence of readers by deploring the smoke nuisance in their own Journal. We are concerned with putting a cast-iron case before the jury, and frankly our trouble is to explain why a case which is so overwhelming, so urgent, and so clear does not win immediate verdicts. It is not that there is something to be said for the other side. Nothing can be said.

My second point is that the householder, the ordinary citizen, is the key to the problem. We know that his smoke is the major factor in pollution, but quite apart from that, he is the jury, and until he is interested (and she is also interested) we can go on proving our case up to the hilt until the errors of our last great rebuilding have been repeated. Now let us look at our Society. We have an imposing array of front-rank men : scientists of distinction, fuel experts, public figures in municipal and national life, medical authorities, public health leaders. We have an army with a flattering magnitude of staff—and a sprinkling of privates. Yet this smoke war is a soldiers' war : it is from nuclei (such as Mr. Richardson and me) that the householders can be won over.

There are three ways open in peacetime to interest the public in smoke abatement—public lectures, Press campaigns, and practical demonstrations. Lectures have low target accuracy, but they prepare the ground well enough, especially if well reported. Press campaigns are better—especially if their leader is well known locally, and is obviously not financially or professionally involved in the fuel industries. In that event the inevitable onslaughts of curiously varied correspondents writing from remote centres do more good than harm.

Practical Demonstration

In war-time the first two methods are almost impossible. A direct claim upon public interest is not practicable when (as all members will agree) an even more obnoxious nuisance claims our attention. We are thus driven to the third—practical demonstration—and I suggest that war or no war, this should be our chief weapon. Indeed, the war increases the importance of our task. Fuel is the driving force of the community, just as it is the driving force of the household, and in addition, as far as the community is concerned it is the foundation of our chemical industries. We simply cannot afford to consider raw coal simply as so many B.Th.U.s, efficiently or inefficiently consumed.

As matters stand we have to build up a two-fold attack. The National Fuel Policy is our weapon for penetrating the entrenchments of local and national government, for enlisting the support of professional and industrial interests, and for meeting the public demand resulting from our second line of attack. Local and national authorities are not by any means the fountains of wisdom in all respects ; to put it bluntly, many of them need an elementary course of instruction in the fields they govern. I shall never forget the spectacle of a well-known alderman at one of my meetings, trying to give me the powerful support of his voice—a voice admirably tinged with that note of quiet authority peculiar to statesmen—and gravely informing the public that electric fires consume the oxygen in a room. We can but hope that the brilliant " array of front-rank men " will continue to press the National Fuel Policy where it is needed most.

Now the householder—our second line. In an imperfect world our appeal must be a different one. Deploring the smoke nuisance, proving the immense waste of national resources, exposing text-book fallacies on fuel, ventilation and health, will not move the householder to reform. I do not attach any importance to veiled opposition to smoke abatement. It has no bearing on the householder's reception of our work, except to make him interested. My files prove this conclusively.

Smoke Abatement Pays

But in exactly 100% of my cases of practical demonstration I have to record success. The point I make is this : smoke abatement pays the householder, directly and indirectly. There is no comparison between the comfort, cleanliness and economy of a home run on modern fuel methods and the discomfort, grime and waste of the traditional methods. It is not a case of argument about differing tastes. It is not even a case of my fanatical support of one particular method. It is the presentation for inspection of hard facts. My home has been visited by friends or by strangers, by willing converts and hard-boiled sceptics, and in every case the obvious facts (in my case backed by figures) have gone home. As a believer in a policy of freedom of choice, I always point out that my own system is not unique, and in spite of attacks from our curious allies on the extreme right wing—the raw coal press correspondents who embarrass their own people by revealing vested interests—I always include modern methods of burning raw coal as useful palliatives and as avenues of economy.

My experience also proves that once stimulated by private interests to 25%, 50% or 100% smoke-abatement, householders quickly take a public interest in securing the communal advantages of smokeless air. They now see the tell-tale line of soot on curtains where the town-air *enters* their rooms. It was masked before by their own grime.

Therefore it is the public duty of householders who enjoy the advantages of smoke abatement to help the Society actively by their open support, and if possible by demonstrating the success of their methods. It is their duty, if they hold any public office, to press for a National Fuel Policy, and to see that their colleagues are at least informed of the facts. I would alike also to see a branch of the Society established to represent householders, with a subscription low enough to draw membership from people who have not made, and do not desire to make, a special study of the subject. For them the Society could, and would, fight against the two difficulties of supply and cost. For them the Society would speak to builders, architects, fuel interests, and local or national government bodies. In a democracy no government can establish reform without public support: no public support can establish reform without the government. We are the bridge between the two, and strong as we are on one side, I claim that we are weak on the other.

I should welcome in the Journal some authoritative review of costs and supply. Personally, I think very little of the elaborate analyses of the cost of running homes on different fuels, although I use them often enough. I see people who think nothing of spending an extra £100 a year on, say, bigger cars, and who work out the cost of, say, gas or electricity to three places of decimals of a penny. In all cases except the really underpaid labourers the cost is not the difficulty. The cost of replacing old apparatus is serious, of course. In some areas supply *is* the bugbear, but in all areas affection for the dirty old coal fire is the root of the trouble.

A Smokeless Steelworks

To the Editor
Smokeless Air.

Sir,—The article on " A Smokeless Pottery " in your Spring issue reminds me of an experience I had some four or five years ago when I had occasion to visit one of the largest and most up-to-date of the plants of U.S. Steel at Gary, Indiana (a city that rivals Pittsburgh in steel output). Two things surprised me—first that so few men seemed to be employed and even at that seemed to have so little to do (admittedly, the plant was only working to 40 per cent. capacity); secondly, that it was all so clean! The sun was shining from a clear blue sky, flowers were blooming freely in beds outside the administrative buildings, and though I spent some hours viewing the various processes, all the dirt I managed to collect was some fine, clean graphite (i.e., pure carbon) which glistened on my hat. I remarked on this to the Manager: his only comment was that smoke meant that there was waste.

Yours faithfully,

A. W. Acworth.

Rebuilding of Britain

—*continued from page* 39

small but momentarily influential or vociferous section, public efforts in building and reconstruction undertaken at great expense have been disappointing in their results.

If the results are what they should be, complaints as to their expense will soon give way to pride in their achievement, but we must ensure, and must educate the people of this country to ensure, that the monuments of such achievement are not in the course of a few years reduced to a general dinginess by smoke clouds of our own making.

I have not had time to refer to all the ideas contained in the contributions to our last issue, and there are many others also to be borne in mind, most of which have from time to time been discussed in this Journal, e.g., the possibilities of district heating, the question of suburban railway electrification, or the lessons to be learnt from the smoke abatement movement and the practical measures already in force in other countries.

Air pollution from sources other than coal, e.g., by the fumes from oil and petrol driven vehicles, and perhaps the encouragement of a wider use of electric vehicles for short journeys in the central parts of our great cities, and the by-passing of such centres by the main stream of traffic deserve consideration.

No scheme of reconstruction in its relation to the problem of atmospheric pollution would, of course, be complete if it failed to take into account and consultation the valuable experience already gained in the various fields of smoke abatement activity, including particularly that of regional smoke abatement committees, and of the Smoke and Sanitary Inspectors and others with daily practical experience of the complex problems involved, or to enlist the expert support of the electrical, gas, and smokeless fuel industries.

As with other great worth-while reforms nothing can be done in the matter without some cost both to the public and to private interests, but as Dr. Julian Huxley wisely says: " Once we strike our balance sheet in social instead of purely commercial terms, smoke abatement is seen to be profitable and necessary."

CHARLES GANDY.

GREENWICH OBSERVATORY MUST GO

★

The following account of an interview with the Astronomer-Royal explains why air pollution at Greenwich has made it necessary for the famous Observatory to look for a new home. It was prepared before the outbreak of the war, and should have appeared in our Autumn, 1939, *number, but was held over because of the situation at that time. Although present conditions may have modified for the time being some aspects of this outstanding example of the smoke nuisance, the facts described retain their full significance. It is now published because plans are being discussed for the building of a new London, and this is evidence of what must be prevented in the future. We believe we are justified in asking: Cannot the new London be a city fit to house its own historic Observatory?*

GREENWICH PARK is all hill and valley. At the highest point, facing the Thames and overlooking a wide stretch of crowded country on the north bank, the Royal Observatory has stood for 264 years. It will not be there much longer, because it is becoming more and more difficult for its essential work to be carried out, and more and more unlikely that it will be able to engage upon new work or to take part in the future developments of astronomical science.

This is a serious matter for the Observatory itself, and, since it is a national institution of unique importance and associations, for us all. And the cause of its difficulties is—atmospheric pollution.

I recently visited the Observatory to discuss the matter with the Astronomer Royal, Dr. H. Spencer-Jones, and, familiar though I am with examining the consequences of the smoke nuisance, it must be admitted that it was rather a shock to learn, in detail, the extraordinary difficulties and expense being experienced as a result of the smoke pall over East London.

" Greenwich," said the Astronomer Royal, " was a good choice of site at the time, and there was no serious trouble until about 1921. Then there was a change for the worse, and from that time conditions have progressively deteriorated. This is confirmed by the experience of the senior members of the staff. It is also indicated by the increased length of exposure required for photographic observations, and by the fact that before 1921 Greenwich generally recorded a higher annual total of hours of sunshine than Kew—about 50 hours a year more. Since that date, however, we have recorded less than Kew by increasingly large differences, so that to-day we have, on the average, about 150 hours a year less sunshine than Kew."

This is shown by the following records of average differences over five-year periods :

1911–15	...	62.1	hrs. in excess of Kew
1916–20	...	65.3	,, ,, ,,
1921–25	...	17.0	,, less than Kew
1926–30	...	66.1	,, ,, ,, ,,
1931–35	...	133.2	,, ,, ,, ,,
1935–38	...	158.6	,, ,, ,, ,,

The reason is that the suspended impurity in the atmosphere at Greenwich so reduces atmospheric transparency that the light, when the sun is low, is too weak to be registered.

Dr. Spencer-Jones returned from South Africa in 1933 and saw at once that conditions were much worse than they had been when he left Greenwich in 1923. He started atmospheric pollution measurement, using an Owens automatic filter, and it is significant that 1935, the year with the least pollution recorded in the period since the observations started, is the year with the least sunshine difference compared with Kew (105 hours) ; whereas 1937, in which the highest pollution was recorded, was the year in which the sunshine difference with Kew was

Below : **A view from Observatory Hill on a day of good visibility, showing " built-up " land extending for miles to the north.**

greatest—223 hours. Incidentally, during the winter of 1937-38, 65 per cent. of the days were recorded as " Z " or smoke-haze days, which was the highest recorded percentage of " Z " days for the six winter months throughout the country.

" Up to about 1920," explained the Astronomer Royal, " Greenwich could be considered to be almost on the fringe of the country as far as the south and south-west, the direction of the prevailing winds, were concerned. Since then the rapid growth of Greater London has resulted in new housing estates and urbanisation on an extensive scale. There has also been a considerable growth in industrial plants along the river, and older plants have been extended."

Observations Impeded

Dealing with the difficulties encountered in the course of observations, the Astronomer Royal said : " Because of the greatly increased absorption of light passing through the atmosphere, exposures for photographic observations have had to be considerably lengthened, and the effect is that the amount of work that can be done over a given amount of clear sky is correspondingly reduced. Clear sky anywhere in England is in any case inadequate, but the efficiency of the instruments is in effect reduced to fifty or sixty per cent. of what it would be in an unpolluted atmosphere.

" And in visual work it is becoming more and more difficult to observe faint stars, so that the programme of observations has to be unduly restricted. Also in meridianal observations—the work for which the Observatory was originally founded—it is necessary to observe stars at low altitude in the north for the purpose of controlling the azimuth of the instrument. These observations are greatly hampered by the poor atmospheric transmission in that direction.

" Many programmes of work depend on comparing the brightness of the stars in one region with those in another region : either the total brightness or that within a certain region of the spectrum. But now, at Greenwich, there is the almost insuperable difficulty that atmospheric transmission is so variable with direction that it is practically impossible to control it. Observations of types taken twenty years ago are now virtually impossible—it is better to have no observations than to have bad observations."

Thus the work at Greenwich, instead of developing as it should through the progress of astronomical knowledge and technique, and by the perfection of new instruments, is becoming more restricted. Instead of the universe opening out it is closing in. That in itself is a sufficient commentary on the state of the atmosphere in our urbanised districts, but it is only one part of the trouble at the Observatory.

The damage done to the instruments by the suspended impurity in the atmosphere is both difficult and expensive to repair, and in its turn also impedes observations.

Grit

" Grit is a serious trouble," said the Astronomer-Royal, " for it gets into the pivots of the instruments and scores them badly. Observations for time depend upon the accuracy of the pivots of the instruments and considerable expense and work is involved in having the pivots reground. In the large new transit circle it is possible to give the pivots better protection, but in spite of all precautions damage occurs. When the pivots have to be refigured, the instrument is out of use for some time, and the accurate determination of the figure of the pivots cannot be done hurriedly. The trouble from the deposition of grit is experienced chiefly when there is a light wind from the north."

Until recently, I was informed, the mirrors used in the instruments were coated with silver films, but a few years ago it was found that an aluminium film had a higher reflective power for ultra-violet light, and that such mirrors were less likely to tarnish. It is now a fairly standard practice to coat mirrors with aluminium, but whereas silvering was a simple operation that could be done in the observatory, aluminising requires a special plant and a high vacuum, and is therefore more economically carried out by sending the mirrors away to be treated by a commercial firm.

" At Lick Observatory on Mount Hamilton," continued Dr. Spencer-Jones, " an aluminised mirror was used for three years, and was then found to have its reflecting power decreased by only one or two per cent. Here at

er view from Observatory Hill, showing extensive rialisation of the district around the Observatory.

Greenwich the reflective power diminishes so rapidly that the film is useless after one year. Recoating is a month's or six weeks' job, which means that our big mirrors cannot be aluminised and that we cannot take advantage of the aluminium surface for reflecting ultra-violet light. Small mirrors can be duplicated with little trouble beyond the expense.

" The excessive tarnishing of silvered mirrors is due to sulphur pollution. That is no worse here than in many other industrial areas, but it is serious : when the big mirror is freshly silvered we can detect almost from night to night the loss of its reflecting power.

" It is standard practice to divide the circles of the instruments on a silver strip, which takes a very fine and sharp cut. In our Airy Transit Circle (the instrument which defines the meridian of zero longitude) the continual cleaning of the graduated strip has resulted in many of the divisions being almost obliterated. At the Cape Observatory there is a similar instrument of the same make, made at the same time, in which the divisions look almost as good as new. If we continue to use this instrument the circle will have to be redivided, which involves taking the telescope to pieces, and then the error of each division will have to be determined! As there are 360 degrees, each divided into 5 minute subdivisions, there are 4,320 divisions in all. To determine accurately the error of each of these divisions involves abour two years' work."

I asked the Astronomer-Royal what he considered to be the most expensive and wasteful item of those he had mentioned. The actual cost of repairs was by no means negligible, he said, but the really serious matter was the *time* that had to be expended in unproductive and yet in the circumstances, unavoidable work by the members of his staff.

Another new and troublesome factor at Greenwich is the glare in the night sky caused by neon and high-power street lighting, and, at the present time, by searchlights. Smoke is indirectly responsible for this, too, for the haze in the atmosphere reflects and scatters the light and so produces the glare. In a perfectly transparent atmosphere there would, of course, be no glare at all. Because of the urban glare, it is never possible now to see the Milky Way from the Observatory with the naked eye.

It is quite definite that the Observatory will have to be moved away from Greenwich to a site free from air pollution. A number of sites have been inspected but no definite selection of a new site has yet been made.

Outside the Observatory, looking north, one sees the vast sprawl of East London : Stepney, Poplar, Bow, East Ham and West Ham, with Greenwich and Woolwich on the near side of the river. Myriads of houses, tenements and flats each with their plumes of smoke : industrial chimneys of every description extending for mile after mile, dominated by the four stacks of a generating station beneath the hill. On a clear day a smudged horizon can just be discerned, and eight miles to the north, on the edge of Epping Forest, at Chingford, a meridian mark was erected a century ago for controlling the azimuth of the transit circle. At that time it was frequently visible, but nowadays, even under the best conditions, it is never seen.—*A.M.*

POST-WAR NATIONAL FUEL POLICY

Points from the Discussion on the Paper Reported in our Last Issue

THE author of the paper, **Mr. John G. Troup,** in presenting the paper and summarising its contents, said the Institute of Fuel had a committee which was watching this problem, but it was felt that nothing of a major nature could be done until victory was eventually in sight.

It seemed to him that the two big problems were the abolition of smoke from the atmosphere and the treatment of coal in such a manner as to recover the constituent parts instead of burning it in the raw state. Arising from that was the further point that we should use fuel in three forms, viz.: (1) the solid fuel which still remained, but was a relatively simple smokeless fuel and relatively simple to handle; (2) and (3) liquid and gaseous fuels, which were ideal for control. There was also the question of standardising apparatus for using fuel and ultimately automatic control.

Other considerations were fuel for transport and distribution, and there was also the question of utilising steam heat, which was now wasted. Electric power stations to-day worked with a thermal efficiency of about 30 per cent., whereas, if it were possible to utilise the latent heat of the steam which was now sent through the condensers, that efficiency would be doubled. In other words, a power station could have a thermal efficiency of 60 per cent. That problem was largely a geographical one, i.e., obtaining an economic load for the heat that was now wasted. That was the goal which was being striven for, and, considered from the national point of view, it was a problem of co-ordination. It was essential to keep a more flexible mind on the whole problem of economics in this matter.

Mr. J. G. Bennett: We were only just beginning to see the dawning of a new era in the utilisation of coal. Carbonisation and combustion would continue for a long time to be the staple uses of coal, which was the most marvellous carbon source existing in the world from the point of view of the chemist. It was being grossly misused. Both carbonisation and combustion were hopelessly incompetent ways of using coal in the eyes of the scientist. Even hydrogenation, attractive as it was, was a rough-and-ready treatment as compared with what could be done and what probably would be done within the next one or two decades. New constructional materials and fabrics of the utmost importance would certainly be derived from coal in enormous quantities and would change all our conceptions of building and clothing. There were biologically active substances to be obtained in the way of medicines, probably plant hormones and the like.

These were developments which we were now just beginning to know something about. We did not know nearly so much as we thought we did 10 years ago about the process of combustion as physical and chemical change, but we were now under the stimulus of war learning with extraordinary speed in some directions. There was a great deal of work going on in secret to-day which would flower afterwards and lead to developments which, he believed, would transform the wealth of this country. He did not suggest that anyone should ask for details of what was going on now, but the war was doing what was necessary to stimulate progress and development, and after the war we should see the fruits of that work. There would be great human developments based on coal and the value of coal would be something very different from what it was to-day. Then we should look back on what were to-day very primitive attempts from the point of view of the utilisation of our coal resources.

Dr. Elvet Lewis : A national policy with regard to fuel was not a thing which could be considered alone, apart from other aspects of national life. It was necessary to consider the national economy of the country, and it was no use talking about fuel if we did not, at the same time, take into account the products which were to be manufactured by means of the energy obtained from that fuel.

What should be done after the war was to see that the war-time rate of expenditure was maintained for two or three years afterwards, at all events, and that the money now going into armaments should go into industry, to turn it over to peace-time production again in order to see that the products which everybody wanted, and would buy, were forthcoming. Until these products were available, we could not go ahead, and it was to be hoped that we would not keep money on one side and hope for the best, as we did in 1931. It was essential that we should not listen to those people who raised the bogey of economy immediately after the war ended. If we could support a successful war we must support the peace, and if the peace was worth while at all then we must expect to pay for it when it came.

It amazed him to find men talking about fundamental research and then all they produced was a new form of coal-burning appliance to burn raw coal! That was not tackling the problem. We did not want grates only; we wanted to turn the coal into something which was more efficient. We could do without the grates very well, and too much money has been wasted in maintaining practices which were wasteful and inefficient. Further waste of that kind should certainly be guarded against in the future.

Mr. H. L. Pirie : It was stated that a relatively small proportion of our annual coal consumption was carbonised, while the open grate used a very large percentage of our annual production of raw coal. This was, of course, incorrect, seeing that the quantity of coal carbonised exceeded by some five million tons annually that used for domestic purposes. Mr. Troup envisaged the ultimate abolition of smoke and the whole of our fuel energy being provided by solid smokeless fuels. No one desired to defend atmospheric pollution, but we must not lose our sense of proportion. Let us see where Mr. Troup's proposals would lead us.

Excluding exports, coal that was subjected to carbonisation at present, and also our national smokeless low volatile fuels, such as anthracite and dry steam, the inland consumption of bituminous coal was about 120 million tons annually. If we were to obtain the same energy from coke we must multiply this 120 million tons by two, which meant that our annual output would have to be increased by 50 per cent., amounting in all to some 360 million tons on the 1937 figures. Had Mr. Troup thought how the productive capacity of the industry could be expanded to cope with this enormous increase, to say nothing of a housing problem of some magnitude which would be created?

That those who were primarily interested in the utilisation of coal and those who were interested in its derivatives in the form of coke, gas and electricity should continue to urge the use of one particular fuel in all circumstances was, in his view, wrong, and the true line of progress lay in the recognition of that fact and in much closer co-operation.

Dr. G. E. Foxwell : He did not suggest that it should be made compulsory by law to use only smokeless fuel, but it should be made compulsory not to produce smoke. It had been made compulsory by law, during the war, not to allow light to escape from our houses, and there seemed to be a sign-post in that connection pointing to methods which might be useful as regards the prevention of smoke production.

He expressed the view that before the rational and efficient utilisation of our coal reserves could be undertaken, the coal industry must be completely reorganised and consolidated. Under present circumstances, he failed to see how coals could be reserved for the uses for which they were particularly fitted; how could we, for example, prevent the best coking coals from going into the domestic grate? He would ask whether it was in the best interests of fuel conservation that we should export coal at all.

District Heating

A Recent Paper and a Letter

MR. A. E. MARGOLIS, who is well known for his special knowledge and experience of district heating, contributes a letter commenting on the article in our last issue by Mr. S. G. Saunders, and with this we are able to give a report of a paper recently read by Mr. Donald V. H. Smith, another authority on this subject, to the Institution of Engineers and Shipbuilders in Scotland (" District Heating and its Relation to Housing and Town Planning," 14th January, 1941).

Mr. Smith, in his paper, points out that although central heating for large buildings is now regarded as a necessity district heating is almost unknown to the general public in Britain, and that even engineers generally consider it merely as a slightly enlarged system of central heating.

The greatest consumer of coal in Great Britain is still the open fire, which is almost unknown on the continent. There, dwelling houses and small rooms are still largely heated by closed stoves, but in all cities and even in small towns and villages, central, and now district, heating has made amazing strides. " Its effects on the atmosphere of continental towns has been so great that many foreigners talk pityingly of our smoke-grimed cities and soot-laden atmosphere."

Compared with 4 to 4½ tons of coal required by an average household in Glasgow modern homes with district heating consume only 1¼ tons of fuel—a development that has taken place within the last twenty years.

Hundreds of district heating plants are in operation in the United States and in Canada.

Mr. Smith examines the figures for coal consumption in Britain, and shows that the heating load is by far the most important load on our fuel supplies. A large proportion of the fuel used for industrial purposes is required for heating the factories—believed to be at least one-half—and the categories are given as :

	million tons
Electric light, power, and gas	33
Domestic fuel, and fuel for warming factories	78
Industrial, for power and process steam	38

" It is evident," he continues, " that heating installations require and use, and also waste, more fuel than all our generating stations consume, and the subject should long ago have had at least equal consideration and study that electricity has received. Unfortunately, in this country it has had practically none."

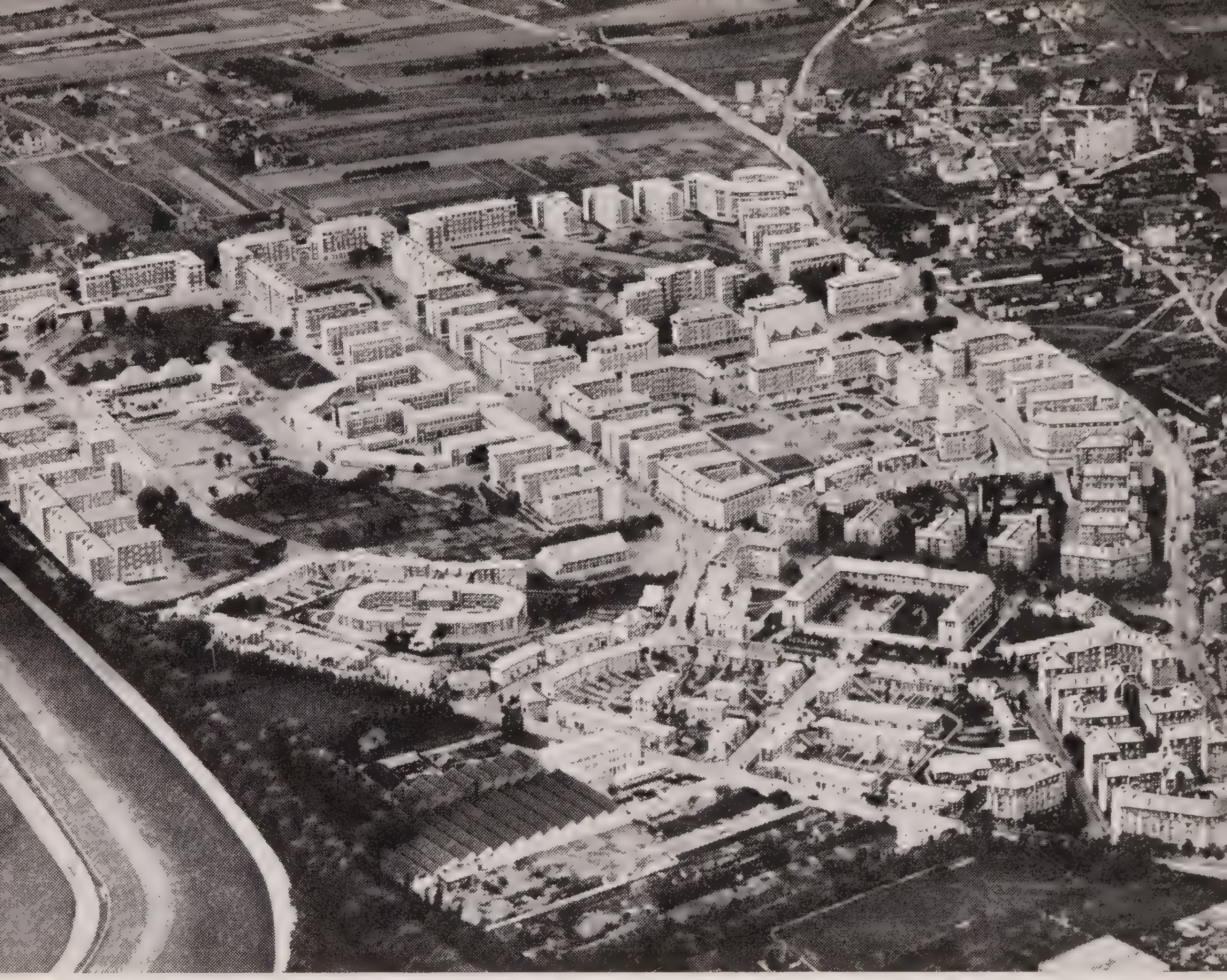
The paper gives a valuable table of some of the principal European district heating systems, and discusses these installations in some detail.

Complete Services

The Steiglitz district in Berlin, for example, has a most comprehensive plant, which deals with the complete range of services, comprising electric light and power, hot water heating, hot water supply, and process steam services to factories. Over 140 separate blocks of buildings are supplied with heat, including over 4,000 houses. The system has a total actual load of 120 million B.Th.U. per hour, but a capacity of about 25 per cent. in excess of this. Both heating and hot water services are by hot water from the central station, from which the most distant block is 1.34 miles. The boilers also serve two turbo-generators of 6,000 kw. total capacity. The thermal efficiency of the station was stated to be 60 per cent. in summer and 70 per cent. in winter.

Germany also has at least twenty similar plants, some of them nearly double the capacity of Steiglitz. Copenhagen has at least one very large plant. In Russia district heating has been adopted with eagerness, and Moscow is now almost entirely warmed and lighted by a series of combined power, light, and heat stations.

Installations that can be called district heating in Britain appear to comprise only two domestic systems of any size, both at Dundee, and a few industrial



Half-way between central heating and district heating on a single system is the Cité Jardins de Suresnes (Seine), Paris, illustrated above, where 2,500 flats are heated by 10,000 radiators. Eighty sectional boilers are used, distributed over 24 heating chambers, each boiler house dealing with an average of five blocks and 400 to 500 radiators. Constant attention is given by the contractor who provides fuel and attendance, the boilers being stoked night and morning. The charge for heating (before the war) was 205 frs. per radiator for the full heating season, which means approximately £8 per year per flat.

installations, including a steam supply to neighbouring warehouses and offices from the Dickinson Street power station in Manchester, which began in 1911.

At Dundee the two installations serve estates of 250 and 268 houses. In both these schemes hot water radiators are fitted in all rooms, but each house has one fireplace in the living room. A municipal wash-house is supplied from the boilerhouse in one case. Examination of the accounts show that the systems pay their way, and that the all-in costs of operation, including fuel, maintenance, labour and management, amount to a fraction under 3s. 2d. per week per house, and the charge to the tenants has averaged a fraction over 3s. 4d. per week.

" This," continued Mr. Smith, " —for providing heat and hot water at a cost less than even slum tenants have to meet for the barest necessities, and amenities which even many of the well-to-do amongst us are without." Schemes had been designed in recent years which could provide similar amenities to working class dwellings at a cost of between 2s. and 2s. 6d. per week.

Costs and Savings

" The outstanding loan debt of local authorities in Great Britain on housing alone is to-day over £600 million. The charges are not wholly met out of revenue, but are partly met from subsidies raised by taxes and partly from the rates. It is said that Scotland alone requires another 200,000 houses at least, and this will add another £80 or £100 millions to the loan charges. If those required in cities in the North of England be added, it is not too much to say that nearly another 1,000,000 houses will be planned and built during the few years immediately after the war. If only half of these were served by district heating plants it would represent a value of £20 or £25 million for engineering works apart from building costs. On the basis of the actual records of the district heating systems mentioned in this paper, it would be possible to effect a saving in the cost of living for half-a-million families of 2s. per week, or say £5 a year, or a total of £2,500,000 per year. At 2½ per cent. this represents the interest on a capital sum of £100 million. That is enough to build all the new houses required in Scotland. In effect, the houses can be obtained for nothing.

"Here, on our doorsteps, is a potential source of work, of economy, and of profit, and plants such as the author has described affect almost all branches of engineering. Not only that, but the smoke nuisance would be effectively dealt with. . . ."

District Heating and Power Generation

To the Editor
Smokeless Air

Sir,—The article by Mr. S. G. Saunders in the Spring number of *Smokeless Air* gave satisfaction to all those who are interested in smoke abatement and district heating. Prevention is the best cure and entire elimination of coal burning and of smoke inside a town by the general introduction of a public heat supply is obviously a better solution than improvements which may be secured by modernised grates or by use of smokeless fuel. It is to be noted that the burning of smokeless fuel reduces but does not eliminate the penalties caused by smoke and deleterious gases and their volume remains practically the same. In many towns on the Continent there are districts with central heating plants throughout, with coke as fuel, but pollution of the air nevertheless persists and it is noticed by the peculiar smell of the air and by the dirty grayish colour of the snow two or three days after it has fallen.

The prevention of the smoke nuisance was, therefore, always one of my arguments for the introduction of district heating, be it for a flats district as in Steiglitz or for an industrial town like Brno, in Czechoslovakia, where the smoke of approximately 100 factory chimneys was completely eliminated by the erection of a district heating installation. Here, with a humid atmosphere and grey skies in the urban environment during the winter, the hygienic significance of district heating can hardly be overestimated. Apart from the solution of the heating problem, the urban population will be provided with pure and healthier air, a brighter sky and more sunshine. It can therefore be asserted that the introduction of district heating will improve the climatic conditions in the great centres of population.

I agree with Mr. Saunders that a great impetus will be given to the adoption of district heating by combining the production of heat with the generation of electric power. On this basis I initiated district heating on the Continent 20 years ago and I was responsible for the design and execution of many installations of this kind. But the method applied by Mr. Saunders in calculating the amount of waste heat per household and the conclusion that "this is equivalent to 20 per cent. of the total fuel requirements for the house when connected to a district heating station" calls for comment.

The fact that the heat required for space heating and the domestic hot water supply is much greater than for electric power generation is indeed a very favourable cogent reason for the introduction of district heating. It means that in the future it would be possible to generate the whole amount of electric power in combined power and district heating plants. But it is at the same time obvious that this development would proceed gradually and the amount of exhaust heat made available would be sufficient for the supply to district heating distribution systems for a long time ahead. With the subsequent expansion of the public heat supply over the area of a whole town, of course, more electric power could be generated than it would actually be required, but, thanks to the grid system, it would be possible to transmit the surplus to districts of a predominantly rural nature.

It should be noted that the available waste heat of condensing stations cannot be used for heating purposes unless the

(*Continued on page* 56)

Who's Who in Smoke Abatement

R. G. L. Anderson

ONE of the earliest and most consistently active of the Advisory Regional Smoke Abatement Committees is that for the West Riding of Yorkshire. From 1927 the chairmanship was in the capable and experienced hands of Mr. R. G. L. Anderson, of Wakefield, who, upon retirement from this position, has recently been presented with an illuminated address as a token of the regard of the members of the Committee.

Mr. Anderson, as Chairman of the Health Committee of the Wakefield City Council, attended the meeting in Leeds in 1925 at which the formation of a Regional Committee was urged on behalf of the Ministry of Health, and on its inception acted as Vice-Chairman until he was elected Chairman two years later.

Mr. Anderson, whose retirement was enforced by ill-health, has been keenly interested in this work, and is of the opinion that much has been accomplished by the Committee in the West Riding—a very smoky region, he points out, where they have had many difficulties, and have had to break through the traditional Yorkshire belief that "where there's muck there's money."

Well-known in East Riding educational circles, Mr. Anderson was for fifty years principal of the Academy for boys, and of the Collegiate School for girls in Wakefield.

He was born at Wilsden, near Bradford, and having no inclination to follow his father as a woollen manufacturer, considered entering the church, and after education at the Yorkshire College intended going to Lichfield to study for the Ministry. The opportunity of taking control of the two schools at Wakefield presented itself, however, and Mr. Anderson started life in Wakefield over fifty years ago.

It was not long before his schools became known throughout the West Riding, and Mr. Anderson himself soon began to take a keen interest in the public life of the city. He was honorary secretary of the Wakefield Institute of Literature and Science from 1914 to 1921, and he was president from 1924 to 1932.

He was elected to the Wakefield City Council as a Conservative in 1917, and became an alderman in 1926, retiring in 1932. In 1920 and 1922 he was Deputy-Mayor of the city, and in 1924 was appointed as a magistrate.

As a member of the Council he did very important work as chairman of the Health Committee for nine years. He served on most of the committees, including the Education Committee.

More recently he has done valuable work as chairman of the panel of the juvenile court, where his experience among young people has helped him in his treatment of juvenile offenders. He is a Fellow of the Royal Geographical Society and of the Geological Society, and a Freemason, being a member and P.M. of the Rectitude Lodge.

THE FUTURE OF THE GAS INDUSTRY

The Gas Engineers' Annual Meeting

THE Institution of Gas Engineers held its 78th Annual Meeting in London on 11th June, when a large gathering heard and discussed a series of informative papers. Of particular interest from the general fuel utilisation point of view was a symposium on " 1941 and After," in which ten short papers were presented.

The subject matter dealt with during the meeting, and what he called the belief of a substantial section of the Industry, was admirably summed up in the discussion by Dr. E. W. Smith, in the following terms :—

1. That the wide variations—as between undertakings—in gas quality should be drastically reduced.
2. That the sulphur content of town gas should be reduced to the lowest practicable minimum.
3. That coke quality and sizing should be given much more attention with the ultimate aim of standardisation from the point of view of the uses to which it is to be put.
4. That the national standardisation of gas appliances is long overdue if cheaper and better equipment is to be available.
5. That time and money spent in developing the uses of gas for commercial and industrial uses is well spent.
6. That encouragement should be given to considered schemes for the improvement of the technical education of the rising generation.
7. That the Technical Press has served the industry well, and that it is expected to discuss " policy " and explore modern trends in administration and technique. There is no room for a " yes, yes " or bouquet Press.
8. That the Industry has an excellent future *only* if, as an industry, it is rationalised.

Sulphur Removal

Few direct references were made to the smoke problem, but the paper on " Sulphur Reduction as a Future Requirement in Town Gas " dealt with a problem that we should naturally like to see completely solved. Even in 1939, said the author, Dr. Harold Hartley, gas was being supplied containing 20 or 30 grains of sulphur per 100 cubic feet. The industry, with a few outstanding exceptions, had never tackled the complete removal of organic sulphur as a primary job. In 1913-14 the South Metropolitan Gas Company was reducing the sulphur in its gas to 8 grains, at a cost of 0.05d. per therm.

It was reported in 1933 that by a combination of two methods used, virtually complete removal of sulphur could be obtained, though with increased operational costs.

Not only would the interests of the gas industry in general be advanced by a higher degree of removal, but flueless gas heating, at present limited by the presence of sulphur, could be extended. The maintenance costs on gas appliances are increased by corrosion due to sulphur in the gas, and it is only when the sulphur content falls below 8 grains that the weight of metal removed decreases rapidly. " The cost of maintaining certain space-heating apparatus and hot water appliances would certainly be reduced if a gas were supplied which contained but little sulphur, and there might be some reduction in cooker and gas fire maintenance. The total economy would not be insignificant. . . ."

" It is essential," concluded Dr. Hartley, " that a real effort shall be made to eliminate sulphur compounds from town gas. Competition is more serious to-day than in 1914, and in the period of reconstruction after the war, the suggestion may have to be faced that the Gas Industry has finished the part it can play in the further development of this country, at least in the domestic field—that it has a glorious past and no future. . . . Gas manufacture now requires the combined skill of the engineer and the chemist, and only if they work as a team will success be assured. There must, however, be a willingness to take risks for the sake of progress. It is best to sell a good article, even if it costs more, and the more brains there is put into the commodity supplied by the Gas Industry, the better will be its position."

Coke Grades

Mr. W. L. Boon, of the London and Counties Coke Association, read a paper on the need for standardising coke grades and properties. "After the war," he said, "the consumer of fuel may be expected, not unreasonably, to raise a more critical voice on the fuels he uses, and it must also be anticipated that the competitive position between solid fuels will be more severe and enable him to exercise once more the freedom of choice between fuels which has not been possible during the war. Hence, coke quality will assume even greater importance in post-war fuel than perhaps it did immediately before the war."

Mr. Boon went on to show how the standards would be required to be evolved for every class of coke utilisation, which fall broadly under six headings, and how in the area of the London and Counties Association, covering a total production approaching 4,000,000 tons a year, the coke has been graded into six standard sizes.

"These sizes have now been in operation," continues the paper, "for the gas coke business in the Association's area for at least five years, and experience has indicated that all consumers' requirements of coke, whether for domestic or industrial use, have been adequately met by one or other of these sizes. Prior to the introduction of these standards there were at least forty different sizes of coke produced and sold in gas coke markets in the south.

"There are no peculiarities from the point of view of gas coke utilisation in any part of the country which, in my view, would require any departure from these standards, and therefore I would urge upon the Industry for the good of its coke business that these standards might beneficially be adopted. As I have previously stated, there seems nothing to prevent standardisation being undertaken during the war period, and I am sure that a wider adoption of these standards could be applied by the Gas Industry to stand it in good stead for its post-war business."

The Co-ordination of the Carbonising Industries

Under this title a long and interesting paper was presented by Dr. G. E. Foxwell. Space, unfortunately, prevents the reproduction of more than a number of passages, but these are given in full.

"The discussion of possible methods of bringing the carbonising industries into logical or organic relation with one another so that they take common action involves issues so far-reaching that within the allowable limits of space it is not possible to do more than indicate the broad outlines. The varied ownership of the carbonising industries, comprising gas companies, municipalities, collieries, and low temperature carbonising concerns—all frequently having divergent interests—increases the complexity of the problem.

"Co-ordination is necessary or desirable for several reasons:

(a) For efficient utilisation of the national coal resources. E. V. Evans has shown that carbonisation conserves coal. Thus a National Fuel Policy should greatly increase the quantity of coal carbonised. But this policy will only be sound if all the products are utilised to full advantage, an objective which can only be attained by co-operation among the industries concerned.

(b) To prevent unnecessary inter-competition.

(c) To promote mutual prosperity by a common sales policy and by regulation of production to meet market conditions."

Gas Supplies

After discussing the internal co-ordination of the gas and coke-oven industries, Dr. Foxwell dealt with the co-ordination of gas supplies:

"The principle underlying the co-ordination of gas supplies must be to make use of as much as possible of the surplus gas that exists in the country, from whatever source it may be derived, and to bring gas into the service of industry as widely as possible. The war has shown that concentrations of population are not necessarily advantageous. If we are to remove slums permanently there should be a development of garden cities, and this must involve spreading industry over a greater area.

" Under war conditions there is no difficulty in the disposal of surplus coke oven gas. After the war this situation will be changed because the demand for industrial gas will probably fall as industry relaxes from present production peaks. Gas undertakings must also search for new outlets for gas.

" For these reasons and in the interests of national town planning, it is here suggested that the gas and coke oven industries together should set up a number of regional gas grids covering industrial areas. The purely residential and agricultural districts too far removed from a grid would be left to receive their supply from local works as at present.

" Some of the possible grids were considered favourably and in detail as long ago as 1934. The Minority Report of the Departmental Committee on Gas Supplies in the West of Scotland (1936) concluded that a gas grid in that area was desirable, though the Majority Report was in favour of a more restricted scheme at that time. The United Kingdom Gas Corporation is already engaged on an embryonic grid in West Yorkshire.

" It is usually possible to prove on paper that the establishment of a gas grid is uneconomic when based upon existing demands for gas. When, however, the gas is available the demand grows and a sufficient supply can be sold to make the scheme profitable. The provision of gas grids should not be regarded in a narrow spirit of immediate economics.

" The coke oven industry for its part could assist in the development of these gas grids by centralising production in very large units situated at a convenient point for the distribution of gas and coke. Large coke oven plants on the Tees and Tyne, for example, would be much better situated for the disposal of their coke by water and of their gas by trunk mains than are the many scattered inland plants in that area. The cost of coal to these plants would be increased by about 2s. per ton over the present pit-head price, or by less if it were sent by aerial ropeway or water-borne in pipe lines.

" If financial difficulties prevent the carbonising industries from carrying out this scheme it might be sponsored by the Government. Great public works, primarily of a civil engineering character, will be undertaken to provide employment for the difficult period after the war. The provision of the necessary trunk mains here suggested might well rank among these schemes in its value to the nation. In districts not served by grids there should be arrangements which would prevent Gas undertakings from building new carbonising plant while a neighbouring existing coke oven plant has surplus gas to sell.

" The grid system here visualised would obviate much of the difficulty and the expense now connected with the problem of ensuring continuity of supply.

" A gas supply of this composite character would not achieve the same standard of constant combustion characteristics as a single Gas undertaking. Appliance makers appear to be designing burners unduly sensitive to the characteristics of the gas supplied to them. This tendency appears to handicap development ; burners of a more catholic taste would seem to have advantages. The non-Bunsen type of equipment is a distinct advance in this direction.

Coke Supplies

" After the war, recognition of the values of coke will grow. The Gas Industry was brought up in the belief that coke was an unimportant by-product. After a century and a quarter much of the Gas Industry has not yet grown out of that belief. In many districts about 99 per cent. of the sales effort is devoted to gas and 1 per cent. to coke ; it is not surprising that those districts complain that coke is difficult of disposal. Most parts of Britain are backward in coke selling methods and everywhere there is much yet to be understood regarding coke quality.

" In order to manufacture coke of the right quality it is necessary first to secure the right kind of coal. There must be a drastic revision of the attitude of the coal industry towards the supply of coal to the gas industry. The national need for conserving coking and gas coals must reinforce the need for manufacturing more combustible cokes by leading to the use of less mature coals for gas making. Co-ordination may well involve setting up common standards of coke quality, including combustibility.

" The sales methods of the coke ovens also leave much to be desired. The Coke Producers Federation formed in Sheffield has shown so promising a beginning that it will evidently have to be extended after the war ; there is, however, nothing like it in any other district. In the South of England, the London and Counties Coke Association has shown the way to the rest of the country, and, in addition, coke sales staffs of Southern Gas Companies have been enormously and successfully extended within recent years.

" The gas and coke oven industries look forward to a considerable extension in the demand for gas and in collaboration they must pay attention to the sale of coke in the export market and at home, to balance production with demand. Selling schemes should certainly be co-ordinated and possibly merged into one combined organisation.

" One form that co-ordination should take is that the coke oven owners should interest themselves in direct selling in the areas in which their coke is sold by becoming active members of the Coke Associations responsible. Unless the coke oven owner adopts this step he is at the mercy of circumstances, almost of chance, in retaining his markets. The two industries should therefore combine, and greatly extend, their coke sales organisations.

Influence of Future Developments

" Scientific research is rapidly changing technical processes. The gases derived from petroleum cracking along with many of the constituents of natural gas, are becoming the raw materials of a huge organic chemical industry. Coal gas can be used similarly though in other directions. The research work of the Institution of Gas Engineers on total gasification may make the Gas Industry technically independent of coke. Unless these developments enable gas to be produced more cheaply in relation to the cost of living than to-day, however, it does not appear that the Industry can afford to give up coke as a by-product. Even if the gas industry ultimately decides to leave coke production in the hands of the coke ovens there will be no less necessity for the co-ordination suggested in this Paper. Active Government support for smoke abatement may be expected and in the present state of knowledge it is only by carbonisation that the necessary fuels can be produced. This gas industry research may enable liquid methane to be produced from coal ; already investigators are studying the use of liquid methane as a fuel for transport engines. The provision of this fuel may alter the whole economics of gas manufacture within our life-time.

" The future holds great possibilities, but these can only be fully grasped if the carbonising industries unite as a co-ordinated whole to produce and sell the manufactured fuels required by domestic consumers and by commercial and industrial concerns."

District Heating—*continued.*

temperature level is raised by a corresponding increase of the pressure of the exhaust steam. This, however, simultaneously increases the steam consumption of the turbines and the heat output. Furthermore, the available heat is in proportion to the total power generation which is per head of population twice or three times as high as the electric power consumption in suburban areas. Therefore, the heat that would be actually available from power stations is much higher than the amount given by Mr. Saunders.

Not half but about two-thirds of the coal consumption of a condensing station is thrown into the river. If it were possible to supply the total demand for heat, for domestic hot water supply, space heating and process work, from combined electric power and district heating plants the saving in coal would be of the order of the present total coal consumption of all authorised electric power stations and gas works in the United Kingdom and a corresponding enormous volume of flue gases would be eliminated from towns. This consideration shows both the great economic importance of district heating and its outstanding value for the solution of the smoke abatement problem.

Yours faithfully,

A. E. Margolis.

(T.10)

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SMOKELESS AIR

The Smoke Abatement Journal

Wartime Issue No. 9 **Autumn, 1941**
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COMMENTARY

Atlantic

MANY readers would note Mr. Churchill's reference, in the stirring peroration to his broadcast on the Atlantic Conference, to the great convoy steaming to these shores with "hardly a wisp of smoke to be seen." As in the last war, smoke prevention has to be rigorously maintained at sea, where a column of smoke may attract hostile attentions as readily as a vivid flower attracts the bees. It is good to know that the principles of smokeless combustion are being remembered and exercised out on the oceans.

Pollution Records

We publish in this issue the whole of the published information on the Investigation of Atmospheric Pollution for the year ending 31st March, 1940—the year of transition from peace to wartime conditions. It is hoped that when conditions permit it will be possible for the full report to be issued, and more important still, it is hoped that a sufficient number of observations are being continued, in spite of all the difficulties, during the war. It will be valuable, in due course, to be able to see how the present situation is reflected in the condition of the atmosphere as compared with the gradually improving records of the last pre-war years. The new report indicates that this improvement was continuing into 1940. It is a useful point to note regarding the increase in the amount of suspended impurity during the intense cold spell of January, 1940.

Our Conservatism

The monthly journal *Coke and Smokeless-Fuel Age* devotes an editorial in its

September issue to the Society's interim memorandum on " Smoke Abatement in Relation to Reconstruction " (see our Spring, 1941, issue). We adopt, it is said, " a strictly moderate attitude and one that will generally appeal to British conservatism." We admit that the Interim Memorandum was very brief and sketchy, but we would be agreeably surprised if all that was implied in it was accepted by the more conservative elements of the nation. However, this first expression of our policy for post-war progress will soon be replaced by a more detailed and comprehensive statement, at present under final consideration, which we believe will be found to make proposals that are limited in their scope only by the obstacles that will be inherent in the post-war situation.

Our contemporary says that it is in the proposals made for domestic smoke that the Society suffers from over-timidity, and makes a proposal of its own for tackling this, the most intricate, aspect of the problem.

Domestic Chimney Observations

" We suggest," says *Coke and Smokeless-Fuel Age*, " for general consideration that the best possible method of stimulating the production of smokeless fuels would be to prohibit smoke emission by law, just as light emission has now been prohibited by law. It could be understood that the law would be enforced progressively over a period of years. At first only bad cases of persistent smoke production would be prosecuted, but each year the regulations would be tightened until within perhaps ten years the production of smoke for more than five minutes consecutively from any chimney could be followed by a police prosecution. Under these circumstances the general public would take steps to change over either their appliances or their fuels or both, and with the rapidly rising demand manufacturers would have time and incentive to erect the necessary plant. Where special appliances are required for small houses it would appear to be a simple matter to put the onus of providing them upon the landlord and to allow him to raise the rent by a penny or so a week in order to pay at least part of the cost."

Thoughts on the Present Coal Situation

We would observe that the three million tons of soot which, it is estimated by the Committee [the Departmental Committee on Smoke and Noxious Vapours Abatement], are discharged into the air annually, are equal in weight to nearly three days' output of all the collieries of Great Britain. In effect, the work of over a million men for three days a year is devoted to providing the soot which pollutes our atmosphere.—*From the Report of the Royal Commission on the Coal Industry* (1925).

A Difficult Method

The control of smoke by observation of domestic chimneys would be infinitely more difficult than the use of this procedure for factory chimneys. The mere task of watching the millions of domestic chimneys would be gargantuan and is hardly likely to be welcomed by the police. And then there would be the old problem of defining what is meant by "smoke" and where and when it acquires a colour, volume, or density that makes it actionable under the regulations — a problem that has so far met with little success in the industrial field, where there is at least a good starting point in *black* smoke. In our opinion the only feasible procedure would be to prosecute for *any* visible chimney emission, which presumably would be the end-stage of the gradual process of tightening-up envisaged. A step-by-step tightening of control over a decade or so would entail a series of classifications of a complexity that would be too much for even the most scientifically minded policeman or for the most patient magistrate.

The control of smoke by chimney observation is, we believe, coming to be recognised as tackling the problem at the wrong end, and to make use of this method in the domestic field appears to be even less logical or practical than it is for industrial smoke.

Fog and Cold

This quarter's " Who's Who " feature on ex-Bailie W. Brownhill Smith mentions the fact that he was the first to tabulate and compare the death-rate during cold weather with the occurrence of smoke-fog. This was a very important factor in demonstrating the case for smoke abatement on health grounds. It had been known for a long time that during heavy smoke-fog the death rate, especially from respiratory diseases, always rose sharply, but as the conditions under which such a fog was produced were usually accompanied by a fall in the temperature, it could be argued that the increase in deaths might be due to the cold rather than to the smoke.

Following a period of severe fog in Glasgow in 1909, Mr. Smith was able to show that there was a heavy increase in the death rate in Glasgow, but only a slight increase in seven other Scottish towns, even though the fall in temperature was greater in these towns than it was in Glasgow itself. Thus, although the influence of temperature may have been a minor influence the major cause of the increase in deaths must have been something that applied to Glasgow alone during the period concerned—and this could be only the heavy smoke-fog that blanketed the city.

Nottingham's Pretty Girls

At the Annual Conference of the Electrical Association for Women, held in Nottingham (an address from which is reported on another page), reference was made in a witty after-luncheon speech by the President, the Dowager Lady Swaythling, to the fact that the city was noted for its pretty girls. The Lord Mayor (Alderman W. Halls), in replying to the speech, agreed (as a Lord Mayor of Nottingham should) that this was quite true. He said that it could be explained by the fact that Nottingham's industries were clean and of a nature that enabled the girls who worked in them in such large numbers to keep neat and tidy and to dress attractively even at, and on their way to and from, their jobs.

This is an interesting explanation, and we think it can be accepted as the real reason for the growth of a pleasant belief. From our own observations during the past year we can say that Nottingham is, comparatively speaking, a clean city (no British city is anywhere near real cleanliness of course), and that the pretty girls are no by means a mere legend. The point—and it is in all seriousness a vitally important point—is that cleaner industries and a cleaner environment make it possible to approach the standards of appearance and outlook that are so quickly and so noticeably debased by the dirt and squalor that still oppress so many of our industrial towns. And, we should like to add, clean and smokeless air makes for better general health, for better complexions, and brighter eyes.

Nottingham has a good lead, and we should like to ask the Lord Mayor to consider how far the fame of his city, and of the comeliness of its people, would spread if, after the war, it made a real effort to become Britain's first Smokeless City.

Must Greenwich Go?

The interview with the Astronomer-Royal, which was published in our last number, was concerned with the serious effects of atmospheric pollution on the work of the Observatory and was entitled " Greenwich Must Go." In other words, the Observatory is being driven from its historic site by the pollution of the air around it. But the Scottish branch of the Society, which has recently been holding its annual business meeting, suggests that it is the pollution and not the Observatory that ought to go. They see the possibility of a special effort being made in this area for the sake of the Observatory and have sent a communication to Lord Reith on the subject. This states that " the members expressed concern that it had become necessary on account of air pollution at Greenwich, for the famous Observatory to look for new quarters," and that it was asked " that in the re-planning of London a smokeless area be created round the Observatory so that its essential work may continue to be performed, and that it will be able to engage upon new work and to take part in the future developments of astronomical science."

THE
HOMES OF TOMORROW

A Symposium Expressing

The Woman's Point of View

THE invitation made to our women readers to discuss their views on the question of the smokeless homes of to-morrow has had a useful and interestingly varied response. Some of the contributions are brief and to the point, some go into more detail ; some are concerned with the practical job of efficient housekeeping, some with the broader aspects of planning for the future. They have in common a sharp repugnance for smoke and its consequent dirt—seen not as an external problem but as a personal experience. The smoke abatement movement should, much more than it is, be impelled by the opinion and support of the women who know the truth about smoke from the inside. The difficulty is, of course, that so far so few of them realise it. Here are the views of some who do—a good cross-section, including housewives, business and scientific women, writers, housing and public health authorities, city and town councillors, and a Member of Parliament.

Let Women Plan

Soot, the Black Death ! Britain's modern plague, far more destructive than the plagues of old. It darkens our days, it impairs our health and vigour, it makes of the housewife a house-slave doomed to years of hopeless battle against the insidious attacks of this modern monster. Let women plan the homes of to-morrow, harnessing science to the problem, and they will evolve smokeless, sootless labour-saving homes, where the prevailing environment shall be bright cheerfulness, instead of that perpetual gloom, so reminiscent of the grave, which has been the characteristic of the town house since the time of Queen Victoria. —*Councillor Mrs. A. A. Barnes, West Ham.*

The Obstacle of Prejudice

" Affection for the dirty old coal fire is the root of the trouble," concludes Mr. Pickston, and rightly. The average householder does not want to believe either that his fire is the cause of smoke, or that smoke is a nuisance. Nor is she prepared even to try burning another kind of solid fuel, still less to install a more suitable grate for burning it. After twelve years experience of using only smokeless fuels, and of trying to persuade others to follow my example, I am convinced that it is this initial step that is most difficult. Once smokeless fuel has been enjoyed for a month the user will never want to return to coal, not even for the sitting-room fire.

If the housewife is to overcome this prejudice, the homes of to-morrow must be planned with every possible attraction, and at reasonable cost. Incidentally, adequate space must be provided for storing the more bulky fuel at a minimum distance from the fireplace. It may be necessary for special privileges to be offered to those who keep a smokeless home. A Government subsidy could be used either to reduce the rent or to cheapen smokeless fuel.—*Councillor Mrs. M. F. Bligh, B.Sc., Gas Eng., Leeds (Twickenham).*

Smoke Abolition

Smoke *abolition*, not smoke " abatement," is of first importance in re-creating towns worthy of the people who are to live in them—*Elizabeth Denby.*

Home Defence Tactics

When Hitler is finished with we shall find we have plenty of enemies at home that we must fight with vigour and persistence. Some may have grown stronger during the war period, and among them the smoke-fiend. We must be prepared to defend our homes from invasion by soot from the air. However free from smoke our individual heating methods may be, that will avail us little if filth from outside can enter by doors, windows and crevices.

We may reasonably expect the present leniency towards industrial smoke to cease when hostilities end, and that local authorities will be instructed by government to enforce the law as before. As before ? In many towns it was a dead letter, and even the progressive ones never enforced it fully because the citizens never demanded it. They grumbled, it is true, especially the women who had the cleaning up to do, but they groused amongst themselves, and therefore ineffectually, instead of aiming definite complaints at the proper target, namely, the local health department. It is a pity, so few people know that public health law positively invites grumbling—of the right kind. Householders may report " nuisances " (of which industrial smoke is one) and every Medical Officer of Health *must* investigate all complaints received. And in common law it holds good that every able-bodied citizen can be called on to help in enforcing law and order.

We can learn from what we are doing now one way of defending our homes from smoke. Hideous and hateful as war is, it is teaching us some very wholesome lessons, and one of these is that when we find ourselves in the front line we must act on our own behalf and act in combination with others. We have to protect our homes from incendiary bombs, so we form neighbourhood fire-watching parties, in which women often preponderate—for the men are watching or serving elsewhere. Why should we not have smoke-watching parties working on the rota system ? The housewife has great opportunities for seeing where smoke is coming from as she glances from her windows or hangs the washing to dry. A little training in an agreed system of observation and recording and the S.W.P. would soon be ready to take the offensive against guilty factory chimneys. And what local authority—however slack about smoke abatement, could stand up against an incessant barrage of irrefutable complaints operated by the numerous S.W.Ps. in their area?—*Marion Fitzgerald.*

Science for Man's Good

A smoky Heaven is unthinkable, so if we want to make this world as much like heaven as possible—as we should—we must eliminate smoke as fast as ever we can.

The ingenuity of man has invented means of getting better results without smoke, yet the conservativeness of man clings to his dirty old coal fire. Let us insist that science shall be used, in this matter, for the good of man and not, as is so obvious in countless ways at the present day, for his grievous harm. —*A. Ruth Fry.*

Dust

Owing to lack of domestic help during this terrible war I have myself to dust the rooms more often than before. I am simply *amazed* at the absence of the usual dust whenever there has not been a fire in the room the previous day. We are at present unable to get smokeless fuel anywhere near here.—*Maud A. Gandy.*

A Tale from Tomorrow

" Different, my dear child? You can't imagine the difference between those towns or ours before the war and now. Before the war we women had so much to do to keep our homes clean we'd no time for anything like this. Just think of the dirt and grime that covered everything; why, two or three years after a white building was erected it was grey, another few years and it was practically black, and thousands of pounds had to be spent to try to clean it, only for it to have to be done all over again in no time at all. This was quite a beautiful city, but so dirty and grimy that it wasn't noticeable.

" Why didn't we do anything about it? Well, nobody seemed to think that it had ever been, or ever could be, different. Until the war; and *then* we women woke up. So many of us had to leave our homes and take our children to live in the country and found, just as I did, that the kiddies grew healthier and stronger and taller, and had fewer chest complaints or rickets or skin diseases—all due to the lack of sunlight, child. And they had lovely gardens to play in, not a backyard with a few stunted trees and sooty grass, and had home-grown vegetables and fruit to eat, and there was so much more leisure for us, we hadn't always to be scrubbing and cleaning and polishing and dusting and washing; oh! when I think of the washing we had to do in the bad old days.

" And so we all had time to help to beat Hitler and his " nasties," and when that was finished with, we came back to the towns, but saw that the pure air of the country was absolutely essential to our well-being. And we knew that we could have it just as well in a town if only we got rid of that pall of smoke that hung continually over us. So we got together and demanded more light and colour; wider streets, treelined; larger, airier rooms with vitaglass windows to let in the sunlight; large gardens in which we could grow the fresh fruit and vegetables so unlike the tired ones we used to buy in our shops, and no more coal fires to befoul the air and shut out the sun and keep us endlessly cleaning.

" And we got it, my dear, in the end, although we had to fight. We hadn't so much say in civic affairs as we have now, and you know how men *will* say " What was good enough for my father is good enough for me "—whoever heard of a mother who thought Grannie knew anything at all about bringing up children (you should have heard your mother when I tried to tell her how to take care of you!)

" But as I was saying, my dear, we won. We had a quite progressive Town Council—after all, what we think to-day the whole country thinks to-morrow—and they actually listened to us and built us homes heated smokelessly and made people who still wanted open fires (yes, there were lots of them, poor dears, who thought it nice to sit around and watch the flames, without caring what effect their dity smoke was having on our health and homes) pay extra rates and *such* high prices for their fuel, and all the hotels and offices had to have central heating systems and the power stations had to wash their smoke. Factories were prohibited in residential areas and had to pay simply terrific fines for emitting needless smoke.

" Until it was found, as it could have been years before if people had bothered to think about it, that we were all cleaner and healthier; and more important, that we were saving colossal sums of money and tons and tons of coal—after all, smoke is simply wasted, unburnt fuel. And that of course altered everything, as soon as the big business people and the Government realised how much we were saving, and England became practically smokeless in——but listen, there is your daddy's plane! Come along, dear child, he's sure to be starving."—*Florence M. Gilders.*

The Open Fire

This little letter deals with only one of many thoughts—the open fire.

In whatever way the housewife obtains her facilities for cooking and hot water, she aims at an open fire—for at least two great reasons, i.e., ventilation by the chimney and the psychological benefits of cheerfulness.

This fire should be in the main dwelling-room, and its chimney should run up the centre of the house or flat; there should be gratings by the cornice whereby the upper rooms share the warmth.

Smokeless fuel should be used. In order to make the price of this fuel come within the power of people with shallow pockets, pressure should be brought to bear on authorities. Already successive Government committees have advocated the necessary work and legislation, but have never brought any scheme to fruition. This is an essential point for the future.

Careful stoking should be taught. A room 16 feet square was kept warm by me for 15 hours a day on 24 lbs. of my favourite smokeless fuel: this fuel never forms a clinker, left only a handful of ash, and the sweeping of the chimney was reduced to a minimum.

Finally, the one open grate will make a cheery family in the Home of To-morrow.—*Councillor Mrs. Alderson Horne* (*Westminster*).

The Extravagance of Smoke

The homes of to-morrow will have to be run even more than those of to-day on lines of economy and labour-saving. This country can no longer afford the extravagance of burning crude coal and wasting its constituents, and we as citizens cannot sanction the defiling of our newly-planned and freshly built cities with the filth from domestic chimneys which disfigured and debased the homes of yesterday.

We must have our coal purified before we receive it, and we will use as little as we possibly can, because we shall prefer the heat we can obtain from turning a gas-tap or pressing a switch to that which involves the labour of scuttle-filling and grate-cleaning—the descent to the coal-cellar, the chopping of wood, the burning of paper. We have learnt the cost of paper, the value of wood—how can we lightly consume the woodland growth of years—the sunlight store of millenia? These wartime stresses have deepened our community sense; we shall be unable to take pleasure in what can be purchased only by loss to the community as a whole.

The coal miners should be paid in accordance with the arduous and perilous nature of their services and the essential value of their product. If this results in a higher charge for coal it will be all the more necessary to see that every ounce of value is extracted from it. We cannot afford to waste so vital a national asset by destroying it in crude form in the open grate and allowing all chemical by-products to escape into the atmosphere as elements of destruction instead of extracting them for economic service before the coal reaches to consumer.—*Millicent Jast.*

Central Heating

If central heating produces less smoke than the ordinary forms of heating I think it would be a great advantage if the " homes of to-morrow " used this form of heating more extensively. Apart from the reduced amount of smoke (if that is in fact the case), from a business woman's point of view, it would be a great asset to be able to go home to a warm house or flat in the winter time. Beside that, the work (very dirty) attached to looking after fires and the dirt from the open coal fires, would be done away with.—*Doris Kay.*

The Little Houses

When considering the homes of the future I think not so much about the already comparatively clean houses of the more spacious suburbs, but of those thousands of closely packed little dwellings in our industrial towns.

Each little house, summer and winter, pours out its contribution to the general murkiness. How any woman living in this cloud of soot manages to keep her home and her children clean is a mystery to me. That some of them do so points to an unending drudgery of washing and cleaning; more than any woman should be allowed to bear.

These little houses will not all disappear after the war. There are millions of them. The blocks of smokeless flats, the gardens, the parks, the nursery schools may come slowly, but in the meantime there are these women toiling daily and hourly to get rid of a little of the blackness that makes their, and their families', lives so dingy.

If the use of raw coal was forbidden in congested areas I can imagine all kinds of delightful changes coming to these little homes. The houses could be colour-washed. Plants would grow in the yards. The pavements would be clean enough for the children to play upon. Curtains would stay clean and people could begin to wear brighter clothes.

Some kind of convenient smokeless fuel would have to be supplied to the towns. Whether or not there is one that would absolutely satisfy every housewife I cannot say. Most women like to " poke the fire," but this craving they must learn to subdue, or perhaps, to tide over the time of change, some bright fuel expert will produce a smokeless fuel which can be poked.—*Doris E. Marsh.*

Opportunity

There are slums in this country; there are industrial areas which defy description in their sordid blackness—some of these areas have been knocked down by the Luftwaffe and all of such areas must be reconstructed. After the war we shall have a fine opportunity to build scientifically planned factories and homes, but great care must be exercised and no effort spared to bring to such a plan every detail of research to procure perfection in both architecture and scientific construction.

Our aim and purpose must be far-seeing and all-embracing. One important consideration should be the removal of the curse of smoke. Whatever is needed to prevent this black filth from filling the lungs of our children and soiling our homes inside and out should be included in any proper reconstruction plan.—*Mrs. John Rathbone, M.P.*

District Heating

In the future might it not be possible, in view of the prejudice against flats, to build rows of small houses, each a unit, yet supplied with a common heating? Hot water laid on like gas or electricity, and the rooms warmed by hot water pipes?

Cooking could be done by gas or electricity and to take the place of the open coal fire as the centre of home life, a small electric fire. The cost of the hot water heating could be included in the rates, and the boiler attached to each row of houses attended to by someone paid by the Council.—*M. E. Richardson, B.Sc. Tech.*

Must a Woman's Efforts Always End in Smoke?

From a woman's standpoint the chief drawback seems to be that smoke abatement is largely in the hands of men, and as few of them have to cope with the evils of smoke they are mostly indifferent. Is it really true that domestic chimneys are the worst offenders? Anyway, nowadays other appliances for cooking are readily available in towns, and fires for warmth are rarely lighted in just those months that the maximum advantage can be enjoyed from sunshine. But see any of our congested factory towns on a bright summer day—the approach to any of them by train is unmistakable by that well-recognised haze, and this is absent from other thickly populated districts which are not manufacturing centres. And if the domestic chimney is the chief sinner, why has the smoke abatement success in such towns as Cardiff and Leicester been proclaimed as an outstanding example of a clean atmosphere?

The open fire burning raw coal has for too long been a tyrant, and is it not chiefly the MEN who are reluctant to see it go? How many women workers in " bed-sitters " bother with an open fire?

Hot water installations, even if only small, should, however, include rails where wet clothing could be dried. We are an extravagant nation in that modern houses have most inadequate facilities for washing at home and the poor and lower middle classes cannot afford laundries ; and many others may soon have to " do " a small home wash as an additional war economy in the future.

Hot water laid on to houses and paid for by a registering meter, as gas is, would be a great boon and smoke eliminator.

Because of the grime in the air central heating causes much deterioration of decorations and is still open to improvement. Knife-edge radiators stuck against a wall . . . why ? Here is a chance for something more artistic and " central."

Where a smoky atmosphere must still be endured, could not the local councils for a small charge, periodically, wash down the exterior of buildings, as they now collect our salvage ?

In former times we could perhaps be forgiven our Black Country and the hideous pall of smoke, with the popularity of such slogans as " where there's muck there's brass," but gas, electricity and smokeless fuels (to say nothing of whatever other scientific manipulation of the world's resources may reveal as further improvements) if made available, could transform our filthy city air into something healthy to breathe.

The enormous extra outlay of labour and cleaning materials necessary in a smoke-laden atmosphere is so often stressed, and rightly so, that it is not proposed to enlarge on it here.

If commercial concerns were compelled to consume their own smoke it is unlikely that the ordinary householder would need much persuasion to use smokeless fuels too, and then we could still be left with an open grate, for not willingly would the famous phrases like " hearth and home " and " fireside " be rendered meaningless, even in this machine age. But the smoke nuisance ought to go the way of the old open drain—that is, disappear, for to that disgraceful category it rightly belongs.—*Blanche F. Robinson.*

The Wartime Home

I am a housewife whose chief job now is not looking after my home, but doing my war job. Nevertheless, I still have to keep my house clean, so this has to be done in the easiest possible way.

I am keeping my home as smokeless as possible, because I find this is the best way of eliminating work. My curtains and covers keep clean longer. I have no sooty grate to clean, no grimy walls to sweep. I have no fear of a soot fall in my absence, and I find the clean dust so easy to remove when I return home.

It is certain that I shall never go back to the old smoky methods when I am again a lady of leisure, and if other housewives would only try for themselves the great advantages of smoke abatement, they too would be converted for all time.—*Mabel Shaw.*

THANKS—NOW AND LATER

IN printing the second list of acknowledgments to those who have so kindly contributed to the Defence Bond Fund, we express our sincere thanks. We are grateful to-day and we shall undoubtedly be grateful anew when, in the days after the war, we are able to call on this Fund to help us through what will undoubtedly be a momentous, and possibly critical, campaign. We had, of course, hoped that the list would be considerably longer . . . but there will be a third list to come.

SECOND LIST OF DONATIONS

	£	s.	d.
Previously acknowledged ...	291	0	6
Frank Fox	10	0	0
Bethnal Green Corporation	5	5	0
Wandsworth Corporation	5	0	0
W. W. Polding	2	2	0
Fulham Corporation ...	2	2	0
Newcastle-under-Lyme Corporation	2	2	0
Henry Gandy	2	0	0
Brighouse Corporation ...	1	1	0
Lincoln Corporation ...	1	1	0
Rothwell U.D.C.	1	1	0
Prof. P. S. Lelean	1	0	0
D. G. Moseley		5	6
Mrs. E. Elwell		5	0
Total (to Sept. 30th)	£324	5	0

Who's Who in Smoke Abatement

W. Brownhill Smith

FEW men have worked so long, so strenuously, and to such good purpose for clean air as ex-Bailie W. Brownhill Smith of Glasgow, who for many years has been Acting-President of the Scottish Branch of the N.S.A.S.

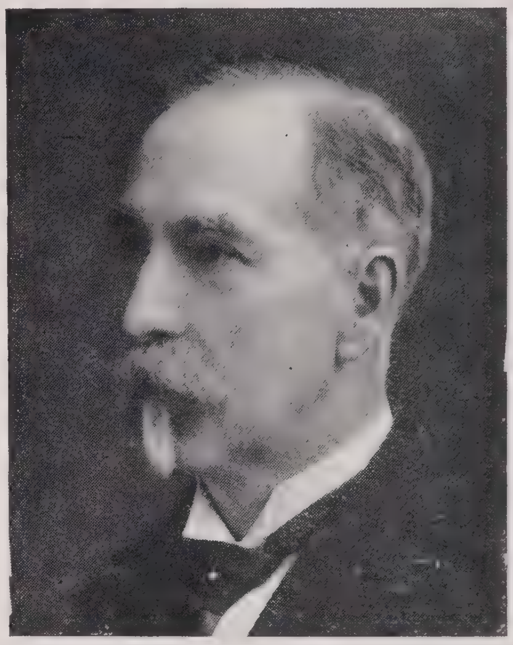
Mr. Brownhill Smith entered the Town Council of Glasgow in 1906, having for his principal reason a desire to secure some effective control over the pollution of the city's air—a subject that then had little interest for local authorities. From then onwards he was actively and keenly concerned with this work. He attended many important conferences, did much research, and gave lectures in many towns and cities throughout Britain. He helped to promote the earlier smoke abatement societies and took part in the formation of the present organisation, of which he is a Vice-President and Executive Committee member.

In 1913, Mr. Smith represented Great Britain at an International Smoke Abatement conference in Pittsburgh, U.S.A., at which he delivered a lecture illustrated by the fine collection of lantern slides he had made.

The Scottish Branch of the Society, which Mr. Smith has led so devotedly and ably, has always been an energetic and influential body. Its annual conferences have done much to influence and direct Scottish public opinion.

Mr. Brownhill Smith was the first to tabulate and compare the death rate during cold weather with the occurrence of smoke fog, and to show that the increase under that condition was in direct proportion to the amount of pollution in the air. It is on this and other aspects of the effects of smoke in relation to health that Mr. Smith has devoted much of his attention.

Perhaps these notes cannot be ended better than by quoting a passage from one of the papers that, vivid in itself, reveals this author's deep feelings for his cause.



" One fine winter day," he says, " when the air was almost still, I stood on a tower on the northern fringe of the city. Looking outward, to the west, north, and east, over an expanse of three-fourths of a circle, I saw a beautiful country; undulating fields stretching out to snow-capped hills in the distance, all brilliant in the sunshine; not a cloud in the sky. In that flood of light were *health-giving* and *disease-curing rays*. Looking southward, below me I saw a sea of dense smoke-fog, through which nothing was visible; but here and there, reaching out above it, was the point of a spire or the crown of a tall chimney. Underneath the surface of that smoke-cloud, enveloped in it, were a million people, breathing and choking; their eyes smarting; the delicate membranes of their noses and throats irritated almost beyond endurance by the acid vapours, and the pungent oily-tar being drawn into their lungs; some of it to stay there and obstruct the free entrance of air into the vesicles. I know that within a few days some would die—those most susceptible, the older and the very young—while many others would contract the beginning of some lasting disease."

A SCOTTISH REVIEW

A Paper on Smoke Prevention and Reconstruction read at the Annual Meeting of the Scottish Branch by the President,

COUNCILLOR ALEX MUNRO

SMOKE prevention should be the dominant keynote when full resumption of activities takes place in the immediate post-war period. It cannot be denied that much hard-won ground will have been lost during the war period owing to the relaxation of smoke standards, changes and loss in industrial personnel, difficulties in distribution of fuel supplies of all types, etc., and in consequence a *laissez-faire* complex so far as smoke pollution is concerned will have developed. Therefore, the problem must be tackled in a salutary fashion as never before.

Educational

This field must be a primary concern and activity of the Society. The present *smoke* mentality must be oriented to conform to the requirements of the post-war aims and conditions and a positive anti-smoke complex must be developed in the community both by popular lectures and discussions for the public at large and technical instruction in all industrial centres for the personnel engaged in the operation of steam and process furnace plant.

A special committee of the Society should be formed to investigate, direct and co-ordinate such activities, always in close collaboration with local authorities and technical educational bodies.

Smoke prevention must begin at the furnace and not at the chimney top. Properly proportioned furnaces, flues and chimneys, together with skilful management, are the basic factors for efficient smoke prevention as they increase the power of the plant and reduce the overhead and fuel costs. If a plant is properly designed there should be no trouble in complying with the requirements of the various smoke regulations, the operation of which will be again resumed after the war.

To ensure that all new plant and reconstructed plant will conform to conditions which will efficiently prevent smoke emission, the Society should take active steps to promote legislation which will necessitate all plans of such plant being first passed by the responsible local authorities before building operations are commenced. This is a practice which is obligatory in many countries and has the effect of ensuring that all plant lay-out conforms to reasonable technical requirements. The present *ad lib* methods are chaotic in the extreme.

(*Note*: This is a special feature of the Bengal Smoke Nuisances Commission. India is far ahead of this country in this respect).

Industrial Smoke

All steam boiler plants and most process furnace plants over a given capacity should be mechanically stoked, while those below a given capacity should be fired with non-bituminous fuel, or alternatively, of course, by oil, gas or electricity. The Society should, therefore, agitate for the promotion of legislation which will give effect to this change in practice. At the same time smaller industrial concerns which find themselves unable to meet the necessary cost should be assisted by Government loans to undertake such work. The employment of skilled boiler attendants and stokers should be compulsory. A plant operative should have been a trainee for a specified period and have passed an elementary examination which will ensure that he is possessed of a given competency. This is current practice in many countries. Industrial estates should be promoted and encouraged to accommodate " non-industrial " industries, and in these estates or zones power and heating supplies should be centralised, and such estates should be without housing areas, much less urban centres. Large centralised gas and electrical undertakings should be situated in coalfield areas to reduce excessive transport charges. This would more than offset distribution costs. The use of gas, electricity or solid smokeless fuel should be obligatory in all " business " heating plants, etc.

Domestic Smoke

As already stated, the active education of the public by popular lectures in all centres should be a major aspect of the Society's activities and this, together with the obligatory use of gas, electricity and solid smokeless fuel will be the only method by which the domestic component of the problem can be solved. To this end the Society must direct its whole weight in the promotion of legislation which will give effect to such conditions. The general use of bituminous fuels for domestic purposes is obviously the primary cause of domestic smoke emission, and irrespective of the efforts made either by plant manufacturers or organisations interested in the use of raw fuel to promote its better use this problem can never be solved or even minimised to any reasonable extent except by the absolute prohibition of the use of raw bituminous fuel. This is probably a cataclysmic step but it must be faced, even in this country, where bituminous fuels are normally abundant and reasonably accessible. The use of at least one open fire in each small household is desirable for the purpose of ventilation.

Smokeless housing zones should be encouraged by the Society. In this way central heating can be more readily encouraged and economically adapted.

The question of costs, while not being lost sight of, should not finally be the arbiter where salutary remedial measures are being sought. That has always been the bogey in this country to radical and basic improvements being effected. Smoke prevention is a long-term investment which will handsomely repay the community in health and happiness, and these two factors can never be measured in terms of finance, either high or low.

NEW LEGISLATION BEFORE RECONSTRUCTION

By

John W. Beaumont, F.R.San.I.

Chief Sanitary Inspector, Halifax

THE excellence and wide scope of the articles which have already appeared in *Smokeless Air* would appear to leave little more to be said upon the subject at the present stage.

It is, of course, obvious that detailed schemes can only follow the establishment of general principles, and when one considers the history of the smoke abatement movement it becomes increasingly evident that future action will have to be much stronger than in the past if any notable improvement in the state of our atmosphere is to be readily effected after the war.

Past

It is now 280 years since John Evelyn wrote " Fumifugium " and made his appeal to King Charles and his parliament to pass an Act to abate smoke. After inveighing against that hellish cloud which produced sickness and death to all living things, he pleaded that his beloved London should be protected against such horrors and its air rendered " fragrant and odiferous."

Alas, nearly 300 years later the smoke of London is greater than it was in Evelyn's day.

Coming to more recent times, it is 42

years since the formation of the Coal Smoke Abatement Society, followed ten years later by the Smoke Abatement League of Great Britain, which bodies amalgamated in 1929 to form the present National Smoke Abatement Society.

Although it must be conceded that during the last decade especially, great work has been done by the National Smoke Abatement Society in calling attention to the many evils associated with the pollution of the atmosphere by smoke, the results of such endeavours have not been commensurate to the energy expended.

The first Committee appointed by Parliament to inquire how far persons using steam engines and furnaces could erect them in a manner less prejudicial to public health and comfort was appointed 158 years after Evelyn wrote his book. This was followed by a number of Select Committees which issued reports, until, in 1845, the Railway Clauses Consolidation Act was passed. This Act, of course, dealt only with smoke from locomotives. Other Acts followed until in 1875 the Public Health Act was passed, being amended in 1926 by the Public Health (Smoke Abatement) Act, which provisions are now incorporated in the Public Health Act of 1936.

Although this very brief resumé of legislation would appear to show that the legislature has during the past century shown an increasing appreciation of the evils of smoke pollution, the results obtained in terms of smokelessness fall far short of what might reasonably have been expected.

Present

Little can be said about the present since it is considered that smoke production should be encouraged in the interests of national security. Paradoxically, it would seem, we are also adjured to prevent the wastage of coal. To reconcile these two requirements would seem to call for the wisdom of Solomon.

In any case it is palpably evident that matters of smoke abatement must rightly be subordinated to the more pressing necessities of a nation at war.

Future

Unless greatly accelerated progress in smoke abatement is made immediately after the war, our newly-built areas in industrial and thickly populated centres will be defiled long before construction is complete.

Can this increased rate of progress be obtained by following the methods of the past?

It has often been said that legislation should follow an enlightened public opinion and never precede it. Such a course would appear to be ideal, especially under democratic government. Does it always obtain the desired results, however, and in any case is progress sufficiently rapid? As far as smoke abatement is concerned, the answer would appear to be in the negative.

Little headway had been made in slum clearance before the passing of the Housing Act, 1930, but, in the nine years before the outbreak of the present war, more was accomplished in this direction than in the previous century. It is suggested that similar legislation dealing with smoke abatement will need to be adopted before we obtain any striking improvement in the condition of our atmosphere.

Vested interests and sloppy sentimentalism must alike give place to the vital necessity for making the air of our populous centres fit to breathe. That object should stand pre-eminent before us.

Next in importance, perhaps, is the adoption of a national fuel policy, whereby we obtain maximum results with a minimum of material. So much has of late been said upon this subject that it is unnecessary to develop it here.

It has been proved in other countries that smoke abatement amounting almost to smoke elimination is practicable.

Sir George Stapledon in " The Land Now and Tomorrow " says :—

" I do not believe there is a single issue upon which public money could be spent on a generous scale with greater national advantage than in seeking the means and in enforcing action that would once and forever ensure that every human being, animal and plant, inhabiting this island breathed only an uncontaminated atmosphere."

The number of people in this country who share the above opinion is greater than ever it was, and it is to be hoped that, following a successful conclusion of the war, the Government of the day will also recognise the truth expressed therein by passing such legislation as will be necessary to give effect to it.

The Miners' Home Coal

An Approach to a Special Problem

MR. PHILIP B. NICHOLSON, J.P., who is a Past President of the Coke Oven Managers' Association, will be known to many members who have attended the Society's conferences. He has put forward the only proposals that are known to us for encouraging some degree of smoke prevention in the homes of the coal miners, and it is because of these proposals that this article has come to be written.

The smoke that comes from the chimneys in the mining towns and villages has a story of its own that adds materially to the general difficulties that stand in the way of progress towards the solution of the domestic problem.

The miner usually receives his household coal at a price well below its market value—perhaps at 4s. or 5s. a ton. To a large extent, therefore, this is payment in kind, or what is, in effect, the retention for his own use of part of what he produces. It is a long-established and quite logical arrangement, and is, either in fact or by implication, a part of his wage agreement.

The relative cheapness and abundance of the fuel supply naturally results in it being consumed much more freely than is the case among other sections of the community. The miners and their families comprise about 5 per cent. of the total population, but they consume about 12½ per cent. of the total coal used for domestic purposes—nearly 4½ million tons.

This generous consumption means both a heavier smoke pall in the mining districts, and in all probability a more than proportionately smaller consumption of gas and electricity or other smokeless fuels for heating and cooking purposes. In Mr. Nicholson's own area of Wath-upon-Dearne, for instance, on behalf of which his suggestions were made, the average consumption of gas was 5,000 cubic feet a year per household, compared with approximately 25,000 cubic feet in an average town. (This and other figures given refer to pre-war days and conditions. The discussions on the proposal took place in 1936.)

In this South Yorkshire area the miners received ten to twelve tons of coal a year at their special price, and the scheme put forward by Mr. Nicholson was that they should have the opportunity, if they wished to take it, of replacing up to four tons out of twelve by an equivalent amount of gas. Thus, if the coal were worth 15s. per ton, a credit could be obtained for 60s. worth of gas, or 12,000 to 15,000 cubic feet, a year. These figures were put forward to illustrate the general lines on which the scheme would work, but a detailed examination on all points, it was explained, would have to be made by joint agreement of the consumers, the colliery company concerned, and the local gas undertaking, including a precise determination of the equivalent values and the way in which the arrangement would be worked in practice.

It was stressed from the beginning that this would be a purely voluntary scheme, and that it would not affect any miner who did not wish to participate in it.

The benefits to the miners themselves, to the colliery company, and to the gas undertaking, not to mention the atmosphere, were pointed out. The gas undertaking, it should be mentioned, was a joint Board, of which Mr. Nicholson was then a member, controlled by three neighbouring local authorities, which, because of the low rate of consumption in the area, had to subsidise it out of the rates. The consumers were the ratepayers, and 70 per cent. of them were miners.

The value of an arrangement of this kind would, in many parts of the coalfields, have an economic importance in helping the collieries, through the distributing gas undertakings, to utilise the surplus gas from their by-product plant, particularly on Saturdays and Sundays, when a fall in the demand for industrial use would be balanced to some extent at least by the increased week-end domestic load.

Study of the press reports on the discussions that took place show that much interest was aroused, both in Wath and farther afield, and that there seemed to be an opportunity for a movement being started that would be widely followed in other parts. Unfortunately, however, in spite of Mr. Nicholson's able advocacy, the scheme did not receive the agreement required, and in the end nothing was done.

This discouraging result seems to have been largely due to a belief among the miners that, as one representative puts it, the scheme " bristled with difficulties, inasmuch as the men's price lists and allowances were concerned." It was also described as " a bad business proposition," and the colliery company concerned also disapproved on the ground that it would " upset an old custom."

The Gas Board itself, composed of representatives of the three urban district councils, appeared to reflect these opinions. At about the same time it decided to make a minimum charge of 5s. per quarter for gas consumed, " owing to the unsatisfactory figures of gas consumption."

The *Yorkshire Telegraph* summed up the position, as it appeared to one of its writers, in the following words :

> " The scheme recently propounded by the Wath and District Gas Board for enabling miners to take part of their coal allowance in gas has foundered on the inherent conservatism of the industry. It has not even been put to the miners because it was felt that it would upset old customs and practice and would add a new complication to wage negotiations. So for the present a sensible notion must ' bide.' It would have helped the gas industry over the one obstacle to popularising the use of gas for domestic heating in coal-mining districts. I don't suppose the last has been heard of the idea. The next generation will accept it as the present generation has accepted pit-head baths."

The Moral

We hope that Mr. Nicholson may, after the war, feel inclined to sound opinion in his area once again on a scheme of this nature. As it is, what has already been done is of considerable interest and value, in that it makes clearer the difficulties that lie ahead of any future progress towards smoke abatement in the mining districts.

Not only are all the usual prejudices with respect to the use of raw coal to be expected in full measure, but there is in addition the complex question of the miner's " house coal " tradition, and its direct connection with wages and privileges.

If a planned movement towards domestic smoke abatement comes into being after the war it is likely to be concerned with new housing rather than with the bigger and more difficult problem presented by existing houses. In the mining areas any such differentiation of fuel usage between new and old houses is clearly going to give rise to difficulties not to be met with elsewhere. And, beyond this, can we envisage the final abolition of the use of raw coal in the homes of those who win it from the earth ?

It is a problem that hitherto seems to have had little attention : indeed, it is the kind of problem that it would be easier to leave on one side. But if the mining districts are using more than twice as much coal as other areas, with more than twice as much air pollution and smoke deposit, then there must be many who would welcome better conditions even at the cost of upsetting old customs. And as Britain moves towards the general abolition of smoke, and the manifold benefits of pure air begin to be appreciated, it is inconceivable that even the most conservative of mining areas will be content to remain as isolated relics of the grimy era of archaic technology from which we are now emerging.

The question is well worth discussion during the present period of inquiry and analysis, and we shall be glad to receive for publication the views of any readers, particularly those who live in the mining districts or who can speak for the miner or for the industry.

The Fuel Economy Campaign

THE enormous expansion of our war effort has increased the task of the coal industry in keeping pace with the demand for coal. The Mines Department has embarked upon a campaign to appeal to the public for the strictest economy in the use of all domestic fuels. The trade organisations representing the various fuel interests are helping, both nationally and locally, and practical information is being given to show how economy can be effected.

Large scale users, including Government departments, are setting an example, and on the industrial side economy is being exercised within the limits set up by existing plant and other considerations.

The Mines Department is extending its technical and advisory services to assist consumers who have to use unfamiliar fuel and who seek to ensure the most efficient and economical operation of their steam-raising plant. The full-time services of the engineers of the Coal Utilisation Joint Council have been secured and the advice of the Coal Survey Officers of the Fuel Research Station will be available.

A Fuel Efficiency Committee under the chairmanship of Dr. Grummell of Imperial Chemical Industries has been appointed by the Secretary for Mines. It includes representatives of the mining, gas, electricity, iron and steel industries, as well as those of technical organisations.

The Mines Departments also announces that at a recent meeting arrangements were completed for the organisation of the coke oven industry with a view to ensuring the maximum possible effort of that industry in assisting the prosecution of the war.

At this meeting the British Hard Coke Association was formed. The Association represents 98 per cent. of the total production of coke oven plants in the United Kingdom.

ATMOSPHERIC POLLUTION IN 1939-40

SINCE the Annual Report for the year ending 31st March, 1940, is not to be published in the usual way, the following summary of the report of the Superintendent of Observations has been prepared.

The number of instruments maintained by the Co-operating Bodies during the year were :—

Deposit gauges	127
Automatic filters	11
Volumetric sulphur apparatus	12
Lead peroxide apparatus	60

At the outbreak of war (which occurred nearly in the middle of the period under review), observations with a number of instruments were discontinued, most of them temporarily. Some measurements for the year are therefore incomplete.

The results obtained with the deposit gauges as summarised by the figures for total solids deposited can be compared with the previous year :—

	Total Solids.	
Class.	1938-39.	1939-40.
A	26	31
B	72	69
C	1	0
D	0	0

This shows that there are more stations in the current year where the deposit falls into Class A than in the previous year, that is to say, the deposit over the whole country, as represented by these deposit gauges, has decreased. This continues the improving trend of deposit as shown in Figure 1 (page 88) of the 25th Annual Report.

The classification of the deposits in the above table is an arbitrary one. For total solids, Class A stations are those recording less than 150 English tons per square mile per annum ; Class B, 150 to 450 tons ; Class C, 450 to 750 tons ; and Class D over 750 tons.

The highest total deposit measured for the year (395 tons per square mile) was in Manchester, while the lowest measured (57 tons per square mile) was at Loggerheads ; both places, however, show smaller deposits than in the previous year.

There were only three complete sets of results with automatic filters, Cardiff, Coventry and Stoke-on-Trent. These are not sufficient to provide a basis for comparison with the previous year. The average monthly suspended impurity does, however, show interesting characteristics, notably maxima, in January, 1940, which it will be remembered was unusually cold. This increased in suspended impurity was no doubt due to an increase in all forms of domestic heating during the cold period despite the shortage of fuel in some districts. All three places show a sharp increase in suspended impurity in October, followed by a minimum in November, although the average temperature for that month was lower than the average for the past 50 years or so. It may be that the continuation of " Summer-time " till 20th November, 1939, and the restriction on the combustion of fuel imposed by the fuel rationing scheme may be responsible to some extent for these minima in November.

The measurement of sulphur gases by the lead-peroxide method does not show any unusual features.

Measurements of suspended impurity by the automatic filter made in Central Park, New York City, shows that New York has its purest air in the afternoon between 1 and 3 p.m., while the measurements for British cities have invariably shown that the early morning air is the cleanest. This difference is no doubt due to the greater convectional turbulence of a continental climate in the daytime resulting in a distribution of the pollution through a greater depth of atmosphere and a corresponding reduction of concentration at ground level.

Further measurements made in Dublin by Dr. Leonard have shown an interesting correspondence between concentration of sulphur dioxide and suspended impurity, the two curves for the average monthly values showing a noticeable degree of parallelism. Automatic filter results at Leinster Lawn, Dublin, indicate a ratio of domestic to industrial pollution of 3.3 to 1 in winter and 2.3 to 1 in summer.

ELECTRICITY IS LOOKING FORWARD

From an Address by

James R. Beard, M.Sc., M.Inst.C.E., M.I.E.E.

President of the Institution of Electrical Engineers

We are glad to be able to record the greater part of an address given by Mr. James R. Beard, a member of the Society, to the Annual Conference of the Electrical Association of Women, held in Nottingham on 24th July last. Space unfortunately has prevented us from printing the address in full, for many members would have been interested in the whole of the first part, where Mr. Beard closely examined the meaning of Planning and showed the need for its continuance in the post-war world.

Planning—in War and Peace

THE war has confronted us with an increasingly planned order of society affecting all of us in our daily lives and perhaps our women most of all. Sometimes it may appear irksome, and like good English people we grumble, but nevertheless we obey because we know that without such planning life would become chaotic and impossible under the present conditions of restricted supplies.

We have, too, the vast plans under which our fighting services are being built up and equipped and our productive capacity diverted from non-essentials to essentials. We are enmeshed in such a maze of planning and control that even two years ago we could not have visualised it as a practical proposition. But we accept it willingly and cheerfully because we know that it is essential to the final success of the effort we have been forced to make in this war which we are fighting to preserve our freedom to choose our own way of life. We forego numerous small freedoms for the sake of those four essential human freedoms of which President Roosevelt spoke in his message to Congress last January—freedom of speech, freedom of worship, freedom from want and freedom from fear.

If such extensive planning is essential in war, we must ask ourselves whether there is any good reason to suppose that it will not be equally essential in time of peace. I believe it was lack of appreciation of this by the democratic countries which in two ways has led the world into its present deplorable condition.

In the first place it was the primary cause of that failing inspiration of the democratic system which we must all recognise as having been widespread and increasing before the war.

Secondly, the democratic countries ignored, or perhaps failed to understand, the extraordinary vigour and achievements of those various totalitarian movements which set out to develop these possibilities of planning in the modern world which the democracies had seemed incapable of exploring with sufficient vigour.

This all leads up to the suggestion that we should unhesitatingly accept the general principle that in the post-war period our nation should be dominated by the idea of a planned society. We must act as a Commonwealth and we can only do so by planning our individual actions accordingly so as to form part of the general plan for the community.

Women have always been the world's greatest planners, as no household or family can carry on successfully and happily without continuous day to day planning in every detail. The hope of the future is that this planning capacity of our women will be extended to the broader fields of national life and that they will more and more take their place as full citizens bearing equal responsibility with men in all plans for civic and national development and keeping the planning of the men grounded on commonsense and practicable aims.

It is easier to talk of such a programme of national planning than to carry it out. Planning in peacetime is inherently more difficult than in war, where the objective is vividly in everyone's mind and almost universally agreed. For efficient peace-time planning we need an equally clear and precise objective and therefore the most important first step is to sort out ideas in advance and to endeavour to obtain the widest agreement as to our aims.

Post-war Planning—The Present Position

In the earlier stages of the war the problems of post-war planning seemed of distant interest and even an undesirable diversion of effort from the need to put every ounce of energy into the achievement of victory. It was discouraged in the highest quarters and this view was widely held even as late as last autumn, when I gave my Address to The Institution of Electrical Engineers. In recent months the situation has been much changed and we have one leading Minister, Mr. Greenwood, devoting himself entirely to the general problem of planning, and another, Lord Reith, giving special attention to certain aspects of it.

This growth of general interest in Post-war Planning is due partly to recognition of the need to define more clearly to ourselves, our friends and even our enemies the kind of world for which we are fighting, and partly to realisation that post-war problems will be enormous and can only be successfully overcome if visualised and planned for in advance. It is also, I think, encouraged by a feeling that thoughts of post-war planning are invigorating and helpful to the war effort in much the same way as recreation is a necessary complement to hard work in times of peace. In these strenuous days ordinary recreation is unattractive and difficult but, as the old adage has it, "all work and no play makes Jack a dull boy," and we must look on this post-war planning as our play.

Not only has the Government itself taken some definite, even though tentative, steps, but much exploratory work is being done by various organisations such as the 1940 Council and the Nuffield Trust, while the professional institutions of architects and engineers are giving attention to the practical application of planning to specific problems with the full encouragement of the Government.

My own Institution of Electrical Engineers has set up a very representative Post-war Planning Committee with various sub-committees dealing with such specialised problems as education, training, research, electricity supply, installations, tele-communications, production and standardisation. It is also encouraging the discussion of such matters in its local centres and at informal meetings.

It is essential that it should be clearly realised that planning is not inherently restrictive or anti-democratic. Under modern conditions of social life planning is, indeed, essential in order to preserve for each class and member of the community the maximum freedoms of individual thought, speech and action, without at the same time interfering with the rights of others to similar freedoms.

Planning in the Electrical Field

As you all know, this industry roughly divides into three main branches—the generation and distribution of electricity in bulk, the distribution of electricity to the consumers and the equipment of the consumers' installations.

The serious defects due to lack of planning first became apparent in the branch dealing with generation and transmission. They were forced on public attention by experiences during the 1914-1918 war and after various partial and ineffective attempts to remedy the situation you will all remember that it was finally and successfully dealt with by the proposals of Lord Weir's Committee which were carried into effect by the 1926 Act setting up the Central Electricity Board.

This body, under the able Chairmanship of Sir Andrew Duncan, and later on, Sir Archibald Page, together with the able team which they gathered round them, has successfully organised this branch of the industry into a co-ordinated whole. Even those who strongly opposed the scheme at its inception now admit the benefits it has brought and it is looked on throughout the world as a model of a successfully planned industry. Naturally there are still features which might be improved and, like all healthy organisations, it must continually strive after still greater expansion and efficiency but no major problems are outstanding and the stress of war has proved its ability to meet the most unexpected demands and conditions. When the war is over, and it is possible to speak more freely about recent activities, there will be still wider recognition of the great benefit the country has enjoyed from having had a planned scheme for electricity generation in full operation before the war began. I do not, therefore, propose to give any attention to post-war planning of generation and bulk supply though naturally it will call for a certain amount of attention.

The real need at the moment is to direct our energies to the other two branches where the picture which is displayed is of a very different character.

Post-War Planning of Electricity Distribution

Some of you may remember that as far back as October, 1933, Miss Haslett invited me to contribute to *The Electrical Age* an article which had considerable bearing on this matter. It was entitled " The Same Electricity for All," and was primarily a plea for a standardised voltage. I pointed out that on the electrical side the consumer was fundamentally only interested in three matters, the voltage, whether the current was alternating or direct and, if the former, the frequency.

Frequency Standardisation. Largely due to the far-seeing and energetic work of the late Sir John Snell the latter no longer worries us. The confusion caused by different frequencies in different areas has now been completely cleared up for the country as a whole and the difficulties which it introduced in the early days are almost forgotten. But the other two matters are still live problems awaiting complete solution, and I feel sure that until that solution is achieved the general use of electricity for household purposes will continue to be seriously retarded. One must admit that in both respects considerable improvement has been made since 1933, but much remains to be done.

Type of Current. The question of type of current is the less difficult of the two. It is now generally accepted that alternating current is the more convenient to both consumer and supply authority and results in a cheaper supply of electricity. Fortunately standardising alternating current directly benefits the supply authorities because it enables them to adopt a cheaper and more flexible distribution system. They, therefore, have an immediate interest in pushing on with standardisation, and most of them are doing so. The latest published statistics show that this has now reached the stage where 88 per cent. of consumers receive an alternating current supply.

Voltage Standardisation. The question of voltage is in a somewhat different category. Nearly 20 years ago the need for standardisation was recognised but the variations were so considerable that some difficulty arose in settling the best standard. This was finally fixed as 230 volts and since then it has been adopted for most new systems and some progress has been made in converting older systems. The latest published statistics show that 51 per cent. of consumers are supplied at the standard voltage, 19 per cent. at voltages of 220-240 which could be standardised at little cost, 21 per cent. at voltages below 220, and 9 per cent. at voltages above 240. Although from a long term point of view voltage standardisation is without doubt in the interests of the supply authorities, it cannot be denied that immediate standardisation would tend to impose a temporary financial burden on those undertakers who, by misfortune, happened in the earlier days to develop their system on a voltage different from that which has since been adopted as standard. It is not a dissimilar problem from that of frequency standardisation and the fact that this problem, which was of an equally difficult and expensive character, has already been solved is convincing evidence that a corresponding solution of the voltage standardisation problem should not be impossible. Like frequency standardisation it will, however, only be solved by a nationally planned scheme which meets as far as possible the difficulties of the supply undertakings but at the same time includes sufficient compulsory features to ensure that unreasonable sectional interests do not interfere with the general plan. It will, of course, mean considerable expenditure — probably about twenty million pounds—and from this point of view forms one of the most desirable schemes which could be put in hand immediately peace returns in order to assist the difficult transition period from war production to peace production. It could well be argued on broad grounds that its immediate benefits, in combining employment with beneficial permanent results to the community as a whole, would fully justify special financial assistance to the industry in carrying it out. Delay would undoubtedly increase the cost.

Other Aspects of Planning

Availability. The day when a supply of electricity could be considered a luxury available to the fortunate few is past. While not a necessity in the same sense as water, food, clothing and housing, it has become an essential feature in providing those amenities which are necessary to a happy, contented and civilised existence and in putting at the disposal of the housewife a tool which, more than any other, is capable of minimising the drudgery of routine household work. Consequently, for that improved standard of living at which our post-war planning must aim, a supply of electricity must be looked upon as one of the essential features and should therefore be available to all members of the community. When a need becomes thus universal we should face the fact that the cost of supply should be to some extent averaged over the community and that the less fortunate members should be assisted by the more fortunate ones.

Thus I would like to see the duty imposed on all supply undertakings to give a supply to any consumer requiring one, whatever the position of his premises relative to the existing mains. Such a requirement would in effect mean that the consumers in a more densely populated area would be assisting those in a sparser area, and would thus line up with the general policy of the desirability in the national interest of dispersing the population, so as to limit the unhealthy growth of dense urban communities and encourage the housing of the population in more healthy surroundings. It would also have considerable influence in encouraging that development of agriculture in this country which is widely looked upon as an essential feature of post-war planning. From this point of view it might be well worthy of receiving financial assistance from sources outside the industry itself.

Price. There is at present too wide a variation between prices in different parts of the country. This is largely due to the piece-meal developments of electricity supply which has resulted in an unnecessarily large number of supply authorities, many of which deal with areas too small for the most efficient operation. There are at present some 600 supply authorities. Of these a quarter are very small indeed and charge an average price of 3¼d. per unit for lighting, heating and cooking supplies. About one-sixth of the undertakings are of economic size and their average charge for lighting, heating and cooking supplies is only about 1½d. Figures indicate that under average conditions the lower limit for an efficient supply area is one which deals with not less than about 20 million units per annum for lighting, heating and cooking. If areas dealing with less than this amount were grouped with larger areas the total number of supply authorities would be reduced from 600 to under 100.

The controversy as to public and private ownership and the association of electricity supply areas with antiquated local government boundaries have hitherto prevented such groupings from being carried out, but the time has undoubtedly come when these difficulties should be resolutely faced and surmounted. Such a solution is not only important from the point of view of providing electricity at the lowest possible cost but would facilitate all the other desirable improvements in electricity supply which we are considering.

Forms of Tariff

Closely akin to the question of price is that of devising a method of charge which is fair as between individual consumers, which encourages the consumer to make the maximum use of the service provided and which enables the supply authority to recover the cost of giving it.

It is an interesting fact that the development of electricity has directed special attention to the importance of load factor and to the division of costs between fixed and running charges. It was not a new conception but neither industrialists, engineers nor the general public had previously fully appreciated that the supplier of any commodity to the public always incurred an initial cost which was independent of whether or not any use was made of the service, and that, further, the cost of supply did not vary directly with the extent to which the consumer used the commodity. Electricity supply has two peculiarities which soon made it necessary to give these factors special attention. The first is that it cannot be stored and therefore the supply authority must be in a position to generate electricity to meet the possible demands of its consumers whether those demands are made or not. The second is that the generation and distribution of electricity involves relatively high capital expenditure for which the interest charges must be met whether the supply is given continually or only intermittently

1. *Flat Rate.* The earliest attempt to meet these requirements was to give separate supplies for separate purposes at different costs per unit. A high price per unit was charged for lighting, which is a service only used for a small number of hours in the year, and a low price for cooking, heating and general purposes, services which are used for longer periods

2. *Two-Part Tariff.* This led to complications in wiring and in other ways, and in recent years the domestic two-part tariff has been introduced in which a fixed lump sum per week or quarter is paid to the supply authority for making the supply available and a small charge per unit is made for the use made of it for any purpose. This method has gradually been accepted by the consumer as a fair and convenient one and has led to a vast increase in consumption for purposes other than lighting. It is not yet compulsory for supply authorities to offer such a tariff but already 80 per cent. do so.

Photo: Electrical Review

James R. Beard

Unfortunately, our out-of-date electricity legislation at present compels all supply authorities to offer flat rate unit tariffs for different classes of use. This position should be reversed and some form of two-part tariff should be made the obligatory basis. Indeed the separate flat rate tariffs could be abolished entirely as their only interest is to a very limited group of domestic consumers who wish to use electricity for occasional lighting. The requirements of this group could be easily met by substituting for the fixed charge of the two-part tariff a comparatively high price per unit for a certain initial consumption. The price and the consumption would be so fixed that together they produced a revenue equal to the fixed charge.

In addition to standardising the two-part tariff I suggest that we should go further and standardise the basis for assessing the amount of the fixed charge. At present this is done in a variety of ways but two of them—rateable value and floor area—have become so widespread that the others might easily be abolished. I also suggest that each large region should standardise either one or the other so that adjacent undertakings do not work on different bases. A form of standardisation which appeals to me could be made applicable to the whole country and would consist in offering all consumers the choice of either of the two standard bases. This would meet the case of individual consumers whose premises are such that one or other basis might affect them adversely as compared with the general run of consumers.

Having educated the consumer to accept the two-part form of tariff and to appreciate the advantages it brings to him, I think that after the war it will be desirable to go further and educate him to accept some limitation to the extent of his demand, at time of peak load, on the supply undertaking. This would enable the supply authority to give a further substantial reduction in the average price per unit. Put another way, it would enable the consumer to use more units at the low price unit without necessitating any increase in the fixed charge. Various technical methods for applying this scheme are being devised but the general principle is that each consumer has a special switch controlling the circuits to certain apparatus which can be temporarily switched off without serious inconvenience to the consumer. Water heaters and the less important fires are cases in point. These switches can be operated as desired by the supply authority from a central point by means of impulses superimposed on the supply mains—ripple control is the technical name. In its own interest the supply authority will not operate the switches unnecessarily as it wishes to keep its output as high as the capacity of its plant permits, and it is probable that in practice the operation will be very occasional and will not appreciably inconvenience the consumer.

Post-war Planning of Consumers' Installations

This offers a very wide scope for constructive work, and the Institution of Electrical Engineers have recognised its importance in the post-war planning scheme. The first concrete action taken by their Post-War Planning Committee was to recommend that a special Installations Section should be established to include those members specially interested and to provide them with facilities for meeting and for reading and discussing papers dealing with the subject. This recommendation was accepted by the Council, and the Section is now established under the Chairmanship of Mr. H. T. Young.

Amongst the matters which require study are the cheapening and simplification of wiring, the provision of more ample lighting and plug points, more convenient switching and fuse arrangements and the standardisation of plugs and fittings. All these are most important for the extensive new house building which will be one of the first post-war developments and their consideration is therefore specially urgent.

Design and Performance of Apparatus. Other matters which are equally deserving of study are those concerned with the design and manufacture of the consuming apparatus, such as lighting fittings, cookers, fires, irons, kettles, refrigerators, water heaters, vacuum cleaners, wash - boilers, washing machines, dish washers, clothes driers and the multitudinous small appliances. These are mostly used by women, and it seems to me that women take far too little share in their design. My experience is that they criticise quite constructively as individuals but there seems to be no adequate machinery for correlating these criticisms and for bringing to the attention of manufacturers the requirements and suggestions of the whole body of users.

In doing so it is essential that the vital importance of standardised production should be borne in mind. By wide standardisation costs can be greatly reduced and the extent of the possible reduction is far more than is usually realised.

I know that there are difficulties in getting wide measures of standardisation accepted in this country, largely due to our individualistic characteristics. We have been too much inclined to think that standardisation meant dull uniformity whereas it really means planned variety in those things where some variety is desirable. There are, however, many matters where variety is not only unnecessary but positively disadvantageous.

Waste Heat for District Heating

To the Editor
Smokeless Air.

Sir,—I have read with great interest the comments of Mr. A. E. Margolis on my article, on the subject of District Heating from the domestic viewpoint, which appeared in your Spring issue. I entirely agree with Mr. Margolis that if we are ultimately, at some future date, able to utilise the waste associated with the entire electric generating capacity of our power stations, the quantity of heat available per head for district heating will be much greater than the amount I suggested. This is the ideal for which we must aim when the development of district heating schemes is initiated. It must, however, be conceded that the realisation of this ideal would, of necessity, take some considerable time, having regard to the varied difficulties associated with the laying of distribution mains in the congested streets of our large existing cities.

We have also to contend with the fact that the prime interest of the C.E.B. is, at present, in the generation and distribution of electricity. In the early days of the " Grid " the possibilities of heat and electricity generation when combined were discussed at a joint meeting between both heating and electrical engineers. Reference to the records of that meeting, which are most instructive, shows that the idea was not received with any particular enthusiasm by the electrical industry. (See Institution of Heating and Ventilating Engineers Proceedings, for 1922-23, Vol. 20).

These difficulties, though by no means insurmountable, have to be overcome.

In my article, therefore, I purposely restricted the argument for adopting district heating to a consideration of the requirements and available resources in the *domestic* field, with particular reference to domestic pollution, feeling that post-war reconstruction schemes in this direction may well present the initial opportunity.

With regard to the total quantity of waste heat given in the article as being available from the electricity requirements of a four person suburban household, this will on analysis be found to take account of the increased heat consumption in the generating station, consequent on the use of back-pressure turbines.

Mr. Margolis's comment has drawn my attention to a typing error in the manuscript, which was unobserved when the proof was checked ; this, however, affects one figure only, and not the accuracy of the calculations. The statement " allowing for an overall efficiency of 25 per cent. in electrical generation " should read " 15 per cent."

The figure of 20,000,000 B.Th.U.s per annum is obtained as follows :

Thermal loss, due to boiler efficiency and radiation, allowing for lower boiler efficiency obtained with plant of this size	20%
Heat equivalent of electricity output (overall thermal efficiency of station) referred to above	15%
Available from exhaust of back-pressure turbines	65%
Total	100%

Thus, annual waste heat available from turbines, on a basis of 300 units per head for a four person household are, per annum :

$$300 \times 4 \times 3{,}410 \times \frac{100}{15} \times 0.65$$

$$=17{,}750{,}000 \text{ B.Th.U.s}$$

say 20,000,000 B.Th.U.s approx.

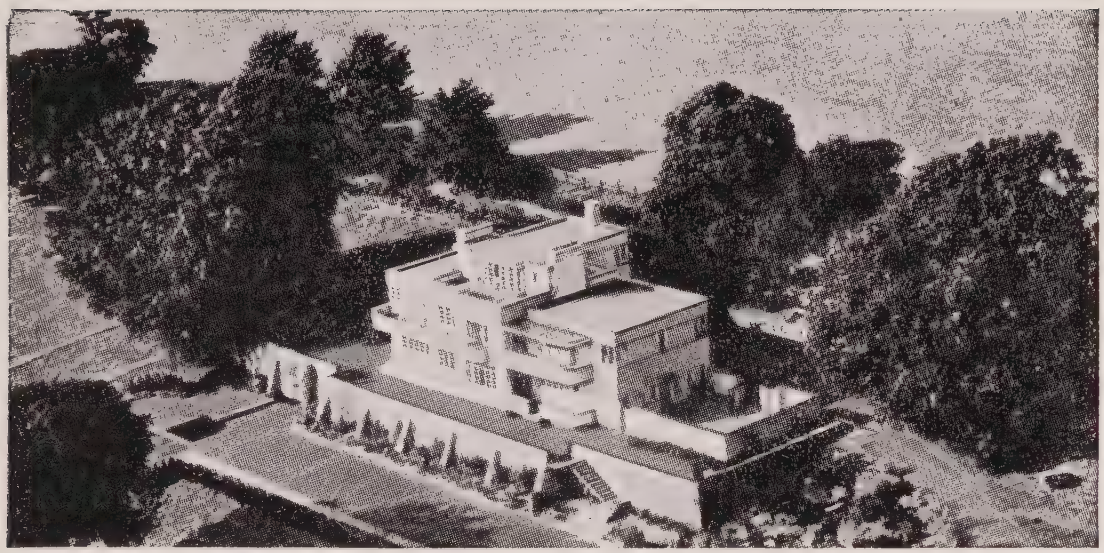
(1 KW=3,410 B.Th.U.s)

On the other hand, where an industrial area is close to a residential district and an economical distribution system can be provided, thus permitting full utilisation of the waste heat associated with the electrical requirements of both, then a far more favourable case can unquestionably be shown.

Personally, I feel confident that we shall, in the post-war years, see, firstly gradual, and then ever-growing developments in the field of district heating ; for progress in a modern enlightened community is, like the passage of time, inevitable.

In this connection it is of interest to note, from Press reports, that the Bristol authorities have recently requested a firm of local engineers to prepare a report on the possibilities of district steam distribution in relation to their post-war rebuilding plans.

Yours faithfully,
S. G. Saunders.



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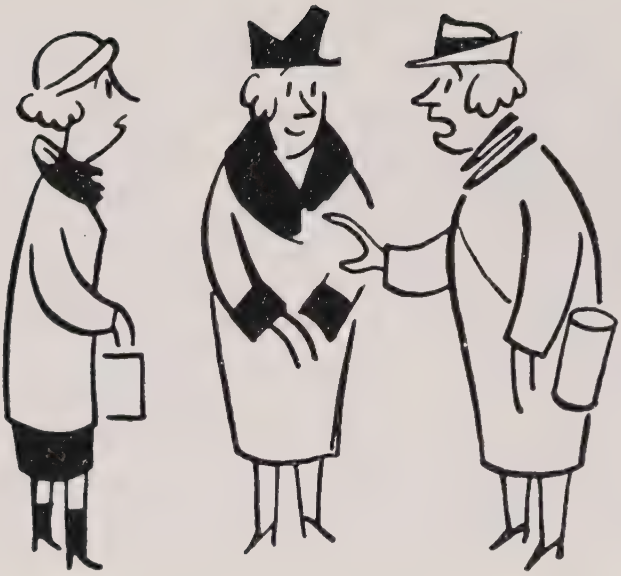

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All bright and glittering in the smokeless air.

SMOKELESS AIR

The Smoke Abatement Journal

Wartime Issue No. 10 **Winter/Spring, 1942**
(Vol. XII., No. 48)

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Smokeless Air

COMMENTARY

A New Chapter

THE Society's new publications, which are discussed in some detail on a later page, may perhaps be given a word from a wider point of view. They give, together with the new annual report, a general idea of where we stand at present and in what direction we are seeking to move. Up to now the war has meant a marking time that might easily have developed into a regression, but now, for the first time since the autumn of 1939, we have something urgent to say which provides the opportunity for moving forward. Like other munitions the new publications do not in themselves constitute an advance, but they do make an advance possible, provided, of course, they are fired with discrimination at the right target and are followed up by other suitable action. It is not too much to say that we are at the opening of a new chapter in the history of smoke abatement. What kind of a chapter the future will show it to be we cannot prophesy, but it may well turn out to be one of the most important of all: and it is largely the responsibility of the Society and all who are concerned with the problem to ensure that it is.

"*Winter-Spring*"

The merging of two issues of *Smokeless Air* into one, which will have been noted, is one of the visible signs of the increasing difficulties of the times. Paper supply problems made it necessary either to reduce the number of pages of our already attenuated journal, or to do as we have done, and to merge two numbers, so that in 1942 (unless conditions should improve) there will be three instead of four issues. This arrangement has helped the situation at the Society's office, where it has been necessary to devote much time to the preparation and publication of the new booklets and the report. Readers will perhaps appreciate that, whereas before the war there were three people in the service of the Society, there is now only one, and that, though many activities are suspended, the helpful principle of the division of labour can no longer be applied. The steady continuation of the Society's work under these conditions has been greatly facilitated by the temporary withdrawal to comparatively tranquil quarters, but the new phase of our work looks like making necessary, for the sake of contacts and availability, a return to that vortex of all cognate activity, London.

Regional Action and Inaction

We record elsewhere the resolutions on the post-war needs for smoke prevention which have been formulated and adopted by the West Riding of Yorkshire Regional Smoke Abatement Committee, and which, it will be noted, are in tune with the Society's proposals, though the latter have of course been so far restricted to initial reconstruction only. We gladly give our support to the Committee's recommendations, and hope that they in turn will support our own memorandum. Moreover, we offer our congratulations to the West Riding for being the only municipal regional committee to have got together during the stress of emergency work for the purpose of dealing with this problem. Is it too much to hope that the other Committees may find it possible to call a meeting and see what can be done? They are all in areas that will require much rebuilding after the war, when it may be necessary to advocate a strong and reasoned local case for smoke prevention measures—especially, perhaps, for the establishment of smokeless zones. We know the difficulties, we know the priority of other municipal and civil defence work—but Yorkshire has managed it!

Liverpool Example

The Regional Committees are not the only bodies which can take a hand in pressing for smoke abatement. From the Liverpool Council of Social Service comes an admirable 20-page illustrated booklet on smoke abatement, which clearly and effectively states the costs and consequences of smoke and shows, with particular reference to Liverpool, what can be done after the war to prevent it. Such a publication must be particularly valuable in the area of its circulation, apart from its intrinsic value, for it comes from an organisation well-known and respected by its readers. It contains some excellent photographs of the effects of pollution on buildings in Liverpool. The Society has a few copies which may be obtained on request, or application may be made direct to the Council at 14, Castle Street, Liverpool, 2.

Publications Received

The Housing and Planning Bulletin, published by the National Housing and Town-Planning Council, reprints in its latest issue Councillor Munro's address to the Scottish branch, and in *Coke and Smokeless-Fuel Age* for January there is an interesting analysis and review of the "Woman's Point of View" feature which was in our last number. The whole of this issue of *Coke* is of interest, for it is devoted to the problems of reconstruction from the smoke prevention and smokeless fuel viewpoints. It includes an advance outline of the Society's new proposals and other articles support or develop their general direction. Among other recent publications there has been little directly relating to smoke abatement, except for a widely-read condensation in *Readers Digest* of a colourful article from Scribner's on the smoke abatement campaign in St. Louis. On the general problems of planning and reconstruction the Winter number of *Town and Country Planning* (maintaining an enviable plumpness) contains a great deal of essential information and articles of wide interest. One, a report of an enquiry by Mass Observation, on whether people prefer flats or small houses, shows that there is a heavy preference for houses among both house- and flat-dwellers.

Chimney Control

The article in *Coke* which discusses our symposium by women members, returns to the suggestion, discussed in these columns in our last number, to the effect that the domestic smoke problem could be tackled by making smoke emission from domestic chimneys a punishable offence and gradually tightening the regulations over a period of years. It may be recalled that we declared that this would be a difficult method, particularly if the " tightening " process meant a series of classifications of smoke densities. It is now stated that we misunderstood the proposal, and that it means not this but rather that " legislation should be passed prohibiting the emission of smoke from houses, but that the police should be instructed only to apply the legislation gradually. If people were fined periodically," continues the writer, " a few each month perhaps in each district, for producing smoke, it would be a powerful incentive towards taking some positive action to install smokeless appliances and to burn smokeless fuel."

It certainly would be a powerful incentive, and this further explanation of what is proposed naturally modifies our criticism. It is, in fact, rather difficult to form a judgment, for against the likely effectiveness of this method would have to be balanced, we suspect, the opinion of the public, the legal authorities, and the police, on the use of a principle which seems to be in the nature of an inverted lottery—with luck one might go for years without drawing an unlucky number in the form of a prosecution. Nevertheless, both this and any other proposal is well worth considering and must be considered in relation to the Society's next series of proposals on the prevention of existing smoke, and we invite readers to let us have their opinions.

In concluding our previous comments on this subject we said that it was beginning to be recognised that the control of smoke by chimney observation was tackling the problem at the wrong end. This is perhaps literally true, but it is an unduly condensed statement, for it should have been made clear that chimney observation for the *prevention* of smoke—i.e., ensuring its complete absence as opposed to permitting it up to some arbitrary standard —remains a very useful means for dealing with certain problems, such as the administration of smokeless zones, where the use of smokeless methods could best be ensured by making *any* smoke emission an offence. Thus, instead of a general prohibition of domestic smoke, to be applied on random lines, there might be a zone-by-zone extension of prohibition, extending over a period of years, but with total application of the law within each zone in turn.

On Fuel Economy

We recently attended a meeting on Fuel Efficiency, held in Nottingham, at the request of the Mines Department, by the East Midlands Section of the Institute of Fuel. It was part of the urgent campaign to promote economy in the use of fuel and was a most practical and successful means for doing this. A full and interesting discussion was opened by Mr. Boon of the London and Counties Coke Association, who gave a brief but stimulating outline of what was required and what could be done. The audience appeared to be composed mainly of industrial fuel-users, and as the discussion proceeded point after point sounded familiar chords in the memory—emphasis being laid upon the deplorable lowness of efficiency in the steam-raising plant of the smaller concerns, the need for intelligent and trained stokers, the value of records for determining and maintaining efficiency (e.g., how much does your steam cost per 1,000 lb.—not one steam-user in a hundred can say). A printed slip distributed at the end of the meeting urged adherence to four recommendations: (1) that all firms become fuel conscious and that directors make themselves responsible for fuel economy; (2) that each firm appoint a competent member of their staff as a fuel efficiency officer to detect and eliminate all waste; (3) that all fuel interests offer the service of specialists to advise consumers; (4) that firms support classes for stokers.

The observer began to day-dream. He saw a score of smoke abatement conferences, a hundred lectures; recalled the words and voices of many a practical, industrially-experienced smoke abatement advocate; remembered text-book and pamphlet, guide for stokers and appeal to industrialists. For ten, twenty, thirty years all this had been said, and said again—said because this was the way to industrial smoke abatement. " Cut out the waste. Train the stoker. Watch the cost. Increase your boiler efficiency. Get fuel economy." It had been said by the smoke-abater to the smoke maker, said by the fuel expert to the fuel waster, said by Government committees to deaf Governments. Said with such appallingly meagre results that now, in the hour of greatest need, it has to be said once again, hurriedly and imploringly.

This is not to criticise or decry the fuel economy campaign. On the contrary, we wish it the fullest success, both because of its urgent immediate importance and because some at least of its results will be permanent. The purpose of the campaign is, of course, simply to reduce fuel consumption, and it has no reference whatsoever to the prevention of smoke—a word, still taboo, which was spoken only once at this particular meeting. But, as far as coal is concerned, the extent of the economy achieved will be broadly proportionate to the incidental reduction of smoke. *You can't have your smoke and burn it.*

Soap

There is no hidden connection between the introduction of soap rationing and the publication of "No Clean City." Legend has it that the English are a remarkably clean race because they use so much soap, but it might be nearer the truth to say that they are using so much soap because they need it. We should certainly suffer more from an absence of soap than would the peoples of less grimy lands.

A *Manchester Guardian* leader on soap rationing gives us a delicious epigram from the U.S.A. which we should have, but hadn't, heard before: "Cleanliness may be next to godliness, but in Pittsburgh it is next to impossible." It is humilating that this was thought of in America, about Pittsburgh, when we might so easily have said it about—well, somewhere in England.

Mockery to Health

"IN spite of the reduction in population, a marked feature of the year was the increase in the number of deaths, from 2,703 in 1939 to 3,300 in 1940. The most notable causes of the increase were deaths due to—(*a*) Respiratory diseases, and (*b*) Violence. In the former case it is probable that the increase in atmospheric pollution brought about by the raising of restrictions upon the production of smoke has been largely responsible for the increase in the number of deaths from bronchitis by 158. Hostile attack accounted for the increase in the deaths from violence. . . .

"The advent of war in September 1939 was a great calamity. Health activities had necessarily to take second place to the one great purpose—that of ensuring our national survival. . . . The crowning instance of this retrogression was the Government instruction to the effect that emission of smoke from chimneys should be *encouraged.* Such proceedings may be justified on the grounds of lessened visibility to enemy aircraft, but from the health point of view it is an absolute mockery. The outrage to the health conscience which such retrograde action involves, and the hold-up of health reforms make it easier to relinquish the reins of office at this time: in this respect one's sympathy is with the successor.

"The termination of the present world catastrophe will be the opportunity for a great forward movement for better health conditions. Of these, Salford's greatest needs are (1) a clean atmsophere, and (2) improved housing. The first can be achieved by a national effort involving national control of the country's fuel resources, but the second is a local problem.

"Under present chaotic conditions, the respiratory organs of human beings are irreparably damaged by huge emissions of inflammable coal products that should be conserved and used for power and transport. Gross national waste goes hand in hand with avoidable mortality and ill-health."

—*From the Annual Report of the Medical Officer of Health, City of Salford, for* 1940. (*The publication of this report marks the retirement of Dr. Osborne, to whom, on behalf of the Society, we extend our best wishes and grateful appreciation for many services in the cause of a cleaner atmosphere*).

Dr. J. S. Owens

DR. JOHN S. OWENS, whose sudden death came as a great shock to all who knew him and to those who had appreciated his great work, was a man of outstanding ability and merit. I became acquainted with him in the early days of the Coal Smoke Abatement Society when, with the permission and co-operation of H.M. Office of Works, tests were being made on open grates in new Government offices in Whitehall. I thought it was important that a correct estimate should be made in the amount of smokefall between the centre of London and the suburbs. Four of Dr. Owen's well-known gauges, slightly differing in form from those now used, were placed, one in the centre of the City, two at Westminster, and one at Cheam, near Sutton. A collection was made once a month and the deposit analysed. The results were published in " The Lancet " and showed, for the first time and in plain figures, the disparity in the amount of deposit of soot and grit between the centre and the suburbs.

Later on Dr. Owens conducted an examination of many types of grates in Government offices for the Local Government Board, now the Ministry of Health. These were of great value and led to a marked change in construction. It was then seen that for further progress in smoke abatement it would be necessary for records to be made of the amount of sootfall in many different localities.

At a conference in 1912, following a resolution proposed by Dr. Owens, a committee was elected under the chairmanship of Sir Napier Shaw, then head of the Meteorological Office. This combination of two great brains became an intimate friendship and sealed the success of Dr. Owens's work, which has continued as The Investigation of Atmospheric Pollution.

Owens was an Irishman and took his degree of M.D. at Trinity College, Dublin. He went into practice for a few years, but his mind was more interested in chemistry and engineering than in medicine, so he threw up his practice and went into civil engineering. His brain, as we came to know, was of the inventive type, and for a time he devoted himself to the designing and erection of groynes for foreshore protection and to other engineering matters. He was, however, poor, and made a scanty income by selling his inventions outright for rather small sums, until, later, he built up a very good consulting practice.

But with all this activity, he was fascinated by the outlet which his great vision saw in working and inventing for the future of smoke abatement. I think he saw it more as a life work than any of us enthusiasts did, and I am sure that if it had not been for Owens, slowly as smoke abatement has grown, it would have been of much slower growth. He threw his whole life and soul into it with unflagging interest.

He was a delightful comrade and colleague and I was for the first twenty years of our work together in very frequent contact with him. His personal life was that of a great scientific man and was unchanged until his death.

His home life was completely simple, and he and his wife were two inseparable and incomparable " pals."

Of him it may truly be said :

"Si Monumentum Queris Circumspice"
Aerem Purum.

H. A. DES VOEUX.

SMOKE AND RECONSTRUCTION

I. No New Smoke?

THE majority of readers will by now have received copies of the Society's new publications—the "Memorandum on Smoke Prevention in Relation to Initial Post-War Reconstruction," and its companion pamphlet "No Clean City." Before publication they were submitted to the Minister of Works and Buildings, the Minister without Portfolio, and the Minister of Health. It is, of course, much too early to say what may, or may not, follow the representations made by the Society. It is also too early to give any kind of a report of how the proposals have been received in general, and how much of a response our appeal for the recognition of smoke prevention, in "No Clean City" has evoked among those who in various capacities are concerned with the planning of the post-war world.

We hope, in the next issue, to be able to give a full account of comment, criticism, and, we hope, support.

> **"Post-war planning is the foundation for physical reconstruction and all the various forms and kinds of development to be instituted with the aim of a better and fuller life.**
>
> **"It is a war aim—a notable and urgent war aim—not a distraction from the war effort. Let not England forget her precedence of teaching other nations how to live."**
>
> —*Lord Reith, in the House of Lords*, 11*th Feb.*, 1942.

The Memorandum

In the meantime, it may be useful to say something about the publications and to emphasise some of their more important points. The Memorandum is, of course, the major publication and has been drawn up on behalf of, and with the final approval of, the Executive Committee. It is largely based on the discussions that have taken place in these columns during the past year and upon ideas and suggestions developed from these discussions.

The statement deals only with what can be done with regard to the building that will have to begin as soon as the war ends, and contains nothing about the problem of smoke from existing sources. Its purpose is to do what is possible to ensure that this existing smoke is not increased by new smoke from the new buildings. These will have to go up, they will all have to have fuel burning equipment, and this will have to be either smokeless or smoke-producing. If, readily and economically, it can be smokeless (and most of it certainly can), why not plan for it to be done?

It will be seen that there are three main propositions put forward. These may be summarised as follows:

(1) All new fuel-burning plant, for all purposes except domestic, should have to have the approval of a special authority before it can be installed and operated. This procedure, though new to this country, has been well-tried elsewhere, and is considered to be the most logical way of preventing smoke. But in addition it must also help to secure fuel economy and the use of the best types of equipment for any purpose. If the building plans of new premises have to be submitted for approval, on grounds of public

interest and town-planning, there can be no valid objection to requiring the prior approval of the fuel-burning appliances to be used in those premises on grounds that are substantially similar.

(2) Smoke prevention measures should be included in the regulations for zoning that are an essential feature of all town-planning. This would apply to special industrial areas, but most emphasis is placed upon the need for securing smokelessness in the central areas of the larger towns. As many readers will know, this latter question was being actively discussed before the war, when it was apparent, even before there was any need for extensive rebuilding, that smokeless central areas could be attained with little technical or administrative difficulty. Now that there is a need to rebuild so much of so many central areas it would be deplorable if the requirements for making these areas smokeless, simple and straightforward as they would be, are not prescribed.

(3) The problem of domestic smoke, as always, is the most complex. As the Memorandum says, " it is hoped that conditions will permit all new houses to be the object of smoke prevention measures, for it will be a serious misfortune if any of them perforce become new sources of smoke emission, adding to the already vast problem of smoke from the millions of existing houses."

The position is fairly straightforward as far as heating equipment other than the open fire is concerned—cooking, hot water supply, central heating, and the use of gas and electricity—but whether the open fires in new houses can be smokeless depends mainly on whether there will be enough suitable smokeless fuel at the necessary price to supply the new houses as they are completed. To this question it does not seem possible, at the moment, to give a definite answer. But it is believed that there could be enough fuel provided the Government authorities responsible for housing policy will say, clearly and definitely, that they intend to have the greatest degree of smokelessness possible and that it is for the industries concerned to plan and organise production to meet the requirements. Clearly the problem needs the closest examination, and therefore the Society makes an important suggestion for the establishment of a special Board or Committee, under a Government department, to carry out this examination and to prepare practical schemes " capable of being fully developed as the situation becomes more determinate."

No Clean City

This little pamphlet should speak for itself. It fails in its purpose if it does not. The Memorandum keeps seriously to its particular purpose, and it was seen that it would become long and less direct if it attempted to describe the reasons why we demand a place for smoke prevention in the plans for post-war building. To those who know the case this would have been unnecessary ; to those who do not know it something more trenchant was required. Hence " No Clean City," which both supplements the memorandum and stands by itself as a direct appeal to all who are concerned about the future of our towns.

II. The Next Phase

With these two publications it is intended to do as much as the restrictive conditions of the present (which include limitations of paper supply !) will allow, and to press for a full recognition of the need for preventing the creation of new sources of smoke emission in the post-war building. But apart from this primary purpose, the memorandum is a valuable document for stimulating a general discussion that may, it is hoped, do much to bring the subject fully into the consciousness of all who will in any way be concerned with post-war planning. We must ask for a critical examination of our proposals, and for as much support as they may deserve. We must continue to improve, develop, and if necessary clarify them. As the conditions of the post-war period become more definite in their outline and the general plans for reconstruction are fashioned, it may be possible to restate the proposals in greater detail, and, perhaps, to add to them.

Wherever the planning of post-war Britain is being discussed—and it is being discussed very extensively—we must see that the factor of clean air is not overlooked or forgotten. It has so often been unwarrantably neglected that it might easily find a similar fate once more. Much depends upon the Society and its members, and upon allied organisations and their members.

III. A Long-Term Programme

Reconstruction implies not only the work that will have to be undertaken immediately after the war, and which will have to comply with the conditions that will then prevail, but also a planned development extending over a period of years. Without a logical, co-ordinated plan the post-war years may easily bring us but a shuffling kind of progress, or even a blind stumbling that may precipitate us into morasses hardly less dangerous than those of war. The plan that will be required will have a two-fold object: it will bring us much of what we need and it will make possible the vast change from war employment and production to stable peace-time employment and production. There must be, as Lord Sankey said in the recent House of Lords discussion, a marriage between reconstruction and employment.

Many aspects of this plan will be concerned with building and urban development; many will deal, we hope, with the better utilisation of our fuel resources; others will help to modernise our industrial equipment, organisation and transport. In short, many of them may, and indirectly must, help to solve the smoke problem. Railway electrification, for instance, will not be undertaken because it will reduce smoke, but it *will* reduce smoke, and so, if this particular development should be considered in relation to the national plan it should be supported by the Society.

And so with many other questions that may come under consideration.

But that is not all. The Society should, in effect, say: "*Smoke can be abolished in its entirety if, during the years after the war, a conscious effort is made to take full advantage of the possibilities offered by modern science and technology. Not only would this assist the marriage between employment and reconstruction, but it would have far-reaching effects of permanent national value. The abolition of smoke should, in fact, be declared to be one of the elements of the national plan.*"

This is not, as yet, an expression of the official policy of the Society, and is put forward rather with a view to stimulating discussion and inviting suggestions for action. But it is thought that it is a view that will be generally supported, and that there will be agreement that, having made proposals for the prevention of new smoke, we should now examine the more complex problem of integrating the abolition of existing smoke with the long-term plans for reconstruction and development.

We hope, therefore, to discuss the most important aspects of this question in subsequent issues of *Smokeless Air*, and to prepare a further memorandum, in the form of an analysis of the problem and a series of appropriate proposals, to supplement the newly-issued statement on the initial phase of reconstruction.

Therefore, simultaneously with the work of pressing forward with the proposals that have just been published, there must develop this further examination, in which the interested co-operation of every member will be valued. A letter expressing your views on the Society's present and projected work would be greatly appreciated and would help us to gauge the general opinion of our members.

* * *

There are thus formidable tasks ahead, which must be tackled under conditions of increasing but inevitable difficulty. They are not tasks that can, or should be, left until the easier days of peace, for we should then find smoke prevention lagging hopelessly behind. The one job by which the Society could directly assist the war effort is unfortunately forbidden us, but, as Lord Reith has said, reconstruction is an urgent war aim. By restoring clean and healthy air to our cities we can help in making Britain a better place in which to live.

PROBLEMS OF FOG AND AIR POLLUTION

By Professor E. G. R. Taylor, D.Sc., F.R.G.S., F.R.His.Soc.

[This article, and the map which accompanies it, appeared in "The Architect and Building News" as one of a series by Professor Taylor entitled "A National Master Plan for Britain," and we are grateful to the Author and the Editor for permission to reproduce them. Although the emphasis of our own policy is directed towards preventing smoke rather than avoiding its effects, the likelihood of some degree of air pollution continuing for a long time makes Professor Taylor's analysis of importance to town-planning, while her map of wind, fog and smoke is extremely useful and interesting.]

IN examining the lay-out of Britain as a site for replanning and reconstruction, it is important constantly to re-emphasise the nature of the problem that confronts us. It is twofold. In the first place we must secure a pattern or spatial distribution of industry and the industrial population which is productive of the maximum efficiency from the national, not merely from the entrepreneur's standpoint. This should ensure that security, in the economic sense, which the masses demand. In the second place the building pattern whether of houses, factories, offices, utilities, must be such as to secure the maximum of amenity—in the sense of health, comfort and beauty—in the social life of the whole nation.

No one could place amenity before security. But are the two aims incompatible? It would be idle to deny that amenity may be destroyed as well as created by a dispersal policy, while the fact that a very high measure of concentration is essential to industrial efficiency must also be recognised. To quote the Ministry of Labour: "Industries in fact naturally tend to group themselves in particular districts, and such industries attract to themselves other industries or services of the same or a cognate character. The localisation of industry that ensues from this brings with it certain economies in production, and possesses certain other undoubted commercial advantages. Thus it not infrequently follows that manufacturers are able to obtain facilities for intermediate or finishing processes essential to the finished product within easy reach, at short notice and at low costs of transport; similarly, the establishment of a major industry gives rise to a number of subsidiary industries whose fortunes are, however, intimately bound up with, and dependent upon, the principal industry.

"From the point of view of labour supply, there are the advantages afforded by the existence of a considerable body of workmen of various types of skill and occupation; from the point of view of production greater facilities are afforded for the advancement and pooling of technical knowledge, and from the point of view of sales there is the advantage of a considerable market close at hand. Moreover, the concentration of the industry frequently leads to the provision of highly co-ordinated marketing, warehousing and selling arrangements, and even, it may be conceded, to the amenities usually associated with urban life, which would not otherwise be possible to the same extent."

"Live near your Work"

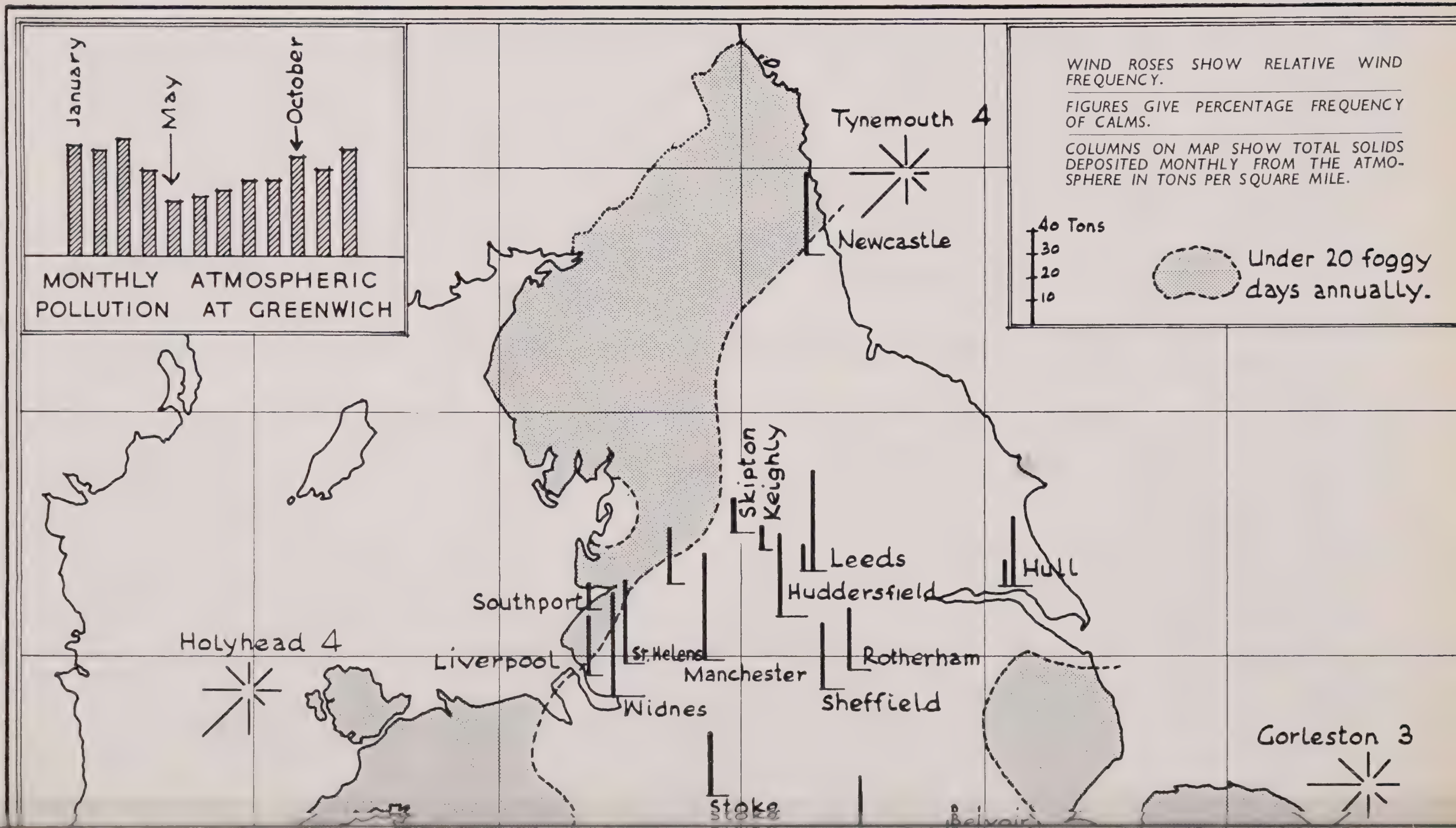
These are weighty words and should be considered in association with the authoritative statement that there is ample room for reconstruction, on lines giving full weight to amenity, within the limits of existing urbanised areas. Factories need no longer be hideous and unseemly; working-class houses need no longer be endless rows of little two-storied boxes. Had as much money and ingenuity been lavished upon advertising the slogan "Live near your work" as has been spent by interested parties on "Own your own house," the disastrous mass flight of the more prosperous to the periphery and the traffic problem which it has created during the last twenty years, need never have taken place. The time and money now wasted on the daily journey to work might have been available after an early return home for leisurely visits to an unspoiled country not far away, where allotment gardens, or "guild farms" of the type envisaged by Sir George Stapledon awaited those who desired them.

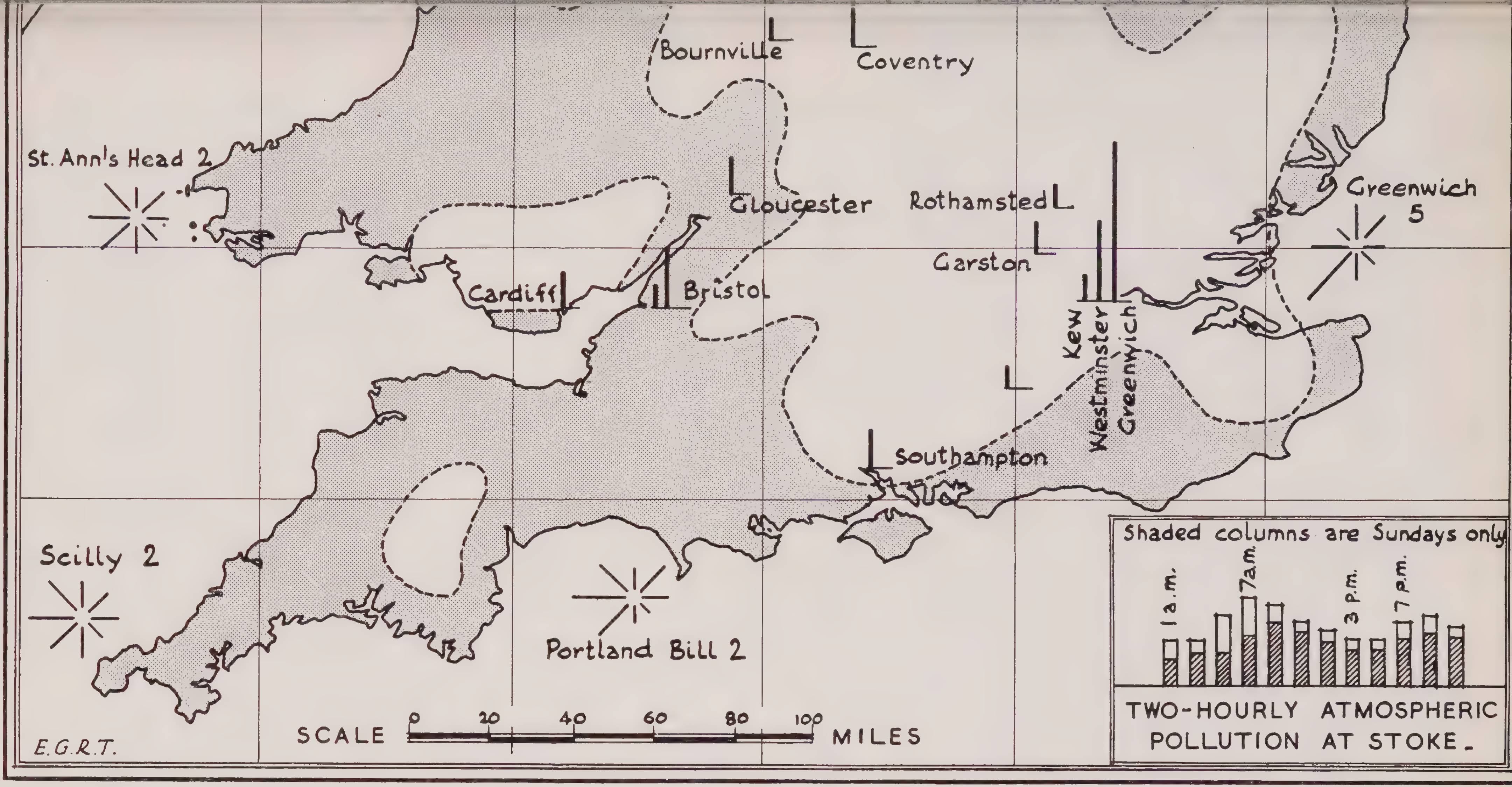
It will be a tragedy if the present opportunity for the reconstruction of city centres results in a so-called "spacious" design which creates new distance problems and involves a weary trudging from point to point or a torrent of vehicular traffic. "Concentration," "accessibility" must be the notes of the business centre, and even of certain (though, of course, not all) types of recreation centre. To which it may be objected that concentration means, *inter alia*, atmospheric pollution, which brings us to the map. It shows by small columns the quantity of solid matter—dust and dirt—which falls from the atmosphere monthly. Even in delightful Godalming, and at rural Rothamsted near Harpenden, where sources of pollution seem to be quite absent, the amount is about 10 tons a month on every square mile. Much of this is just wind-blown dust, but in large towns it includes greasy soot, sulphur, acids or alkalies, and indeed a great variety of deleterious substances, as the housewife well knows when she takes down her dirty and often rotted window curtains: as the amateur gardener knows when he looks at sooty shrubs and meagre flowers. Note the height of the columns for such places as Manchester, Leeds, Stoke—here the amount of deposited solids is increased four-fold or even more. In some of the industrial towns there are two columns, a short and a long—at Leeds, for example, at Hull and at Bristol. The short column is the deposit measured in some residential suburb—in the "west end" in fact—and is little more than that in a country town. That is because smoke and dirt are carried "down-wind," and as the adjoining wind-diagrams or "wind-roses" show, our most frequent (and usually strongest) winds are from south-west or west. Hence the very high figure for such a place as Greenwich, which receives much smoke that is not of its own creating.

Fog

It is the combination of atmospheric dirt with natural fog or mist which produces the yellow or black fogs which are such a nuisance feature of winter in London, Manchester, and some other of our great cities. Now, natural fog is extremely capricious in its occurrence: it comes and goes among the hills, but is also very prevalent in valley bottoms, especially when they are damp and cold, as they are in the autumn and winter months. The Thames valley is very liable to such fogs, and when they combine with the smoke and dirt of East London and Dockland the results are such as we know, not only unpleasant but very costly to industry in traffic delays. As the map indicates, the west of England is singularly fog-free, having under ten days a year—and this, as well as the burning of anthracite coal, may account for the cleanliness of the air in Cardiff, Coventry, too, has a very good record, ascribed locally to the free use of gas and electricity, but not without its relation to local topography and meteorology. The flanks of the Pennines, both in East Lancashire and the West Riding, have a high incidence of "natural" fog and therefore of gloomy smoke hazes in towns and the accompanying necessity of artificial light. Statistics show that there is commonly a loss of from 30 to 40 per cent. of light in the centres of industrial towns, and in extreme cases the figures may be as high as 60 to 70 per cent.

It is a fortunate fact that although the winds in the west of Britain are the more violent, and so check fog-formation, those in the interior of the country are more gusty or "turbulent," as it is called: and it is turbulence that dissipates smoke and dirt in the direction in which we should prefer it to disappear, namely, upwards rather than down-wind. Scientific investigation of turbulence is only just beginning, but it should have important results in respect of the siting of industries and plant (e.g., brass foundries) that have harmful effluents, as well as of colliery spoil-


January
May
October
MONTHLY ATMOSPHERIC POLLUTION AT GREENWICH
Tynemouth 4
Newcastle
WIND ROSES SHOW RELATIVE WIND FREQUENCY.
FIGURES GIVE PERCENTAGE FREQUENCY OF CALMS.
COLUMNS ON MAP SHOW TOTAL SOLIDS DEPOSITED MONTHLY FROM THE ATMOSPHERE IN TONS PER SQUARE MILE.
40 Tons
30
20
10
Under 20 foggy days annually.
Skipton
Keighly
Leeds
Hull
Huddersfield
Southport
St. Helens
Manchester
Rotherham
Sheffield
Holyhead 4
Liverpool
Widnes
Stoke
Gorleston 3



WIND, FOG AND SMOKE

(Data for the map were obtained from the Annual Reports upon Atmospheric Pollution of the Department of Scientific and Industrial Research.)

banks, sewage outfalls, refuse dumps, and the like. Where such establishments already exist new building should only take place up-wind if possible.

City Centres.

The point may be raised that reconstructed city centres will be made smoke-free, and hence that a study of atmospheric conditions is unnecessary. Actually, however, the fact of the redistribution of smoke by the wind has the result that even were a smoke-free area created of a square mile in extent, it would still have from 45 to 75 per cent. as much smoke as surrounding areas. This is supposing the winds to blow equally from all quarters. Were the smoke-free area created downwind of a congested quarter the situation would be worse. Examination of the wind-roses suggests that a new smoke-free suburb or satellite town should lie to the north-west of the old city, because of the infrequency of south-east winds, but local topography does curious things with winds, and each case should be investigated on its merits.

A last point must be a reminder, emphasised by the map, that the domestic fire is at least as important as the factory chimney as a cause of atmospheric pollution. This is well brought out by the two marginal graphs, one of which shows atmospheric pollution month by month, the other hour by hour. The falling-off of the pollution in the month of May corresponds with the discontinuance of the parlour fire in the warmer weather, and the figure rises again in October when fires are re-lit. The hourly or rather bi-hourly graph shows a sharp rise when fires are lit and furnaces stoked in the mornings ; there is a fall in the afternoon when domestic fires are banked down, but the smoke rises again when they are made up for the evening meal and the family gathering round the hearth. Will the average Britisher ever relinquish the smoky coal fire in favour of central heating, gas or electricity ? That is a question outside our scope, but so long as there are smoky chimneys, the way the wind blows must be in every planner's mind.

THE WEST RIDING REGIONAL COMMITTEE

FOLLOWING are the Resolutions referred to under " Commentary " which were adopted at meetings of the West Riding of Yorkshire Regional Smoke Abatement Committee at meetings held on July 4th and 25th, 1941.

Administration

1. That there is an urgent need for a Post-war National Fuel Policy to (*a*) conserve raw material, (*b*) get the utmost value out of the coal used, and (*c*) prevent atmospheric pollution.

2. That this Committee is of opinion that in any reconstruction of Government areas due regard should be given to the appointment of suitable officers competent to deal with smoke abatement and that the services of experts in smoke abatement be made available to groups of local authorities within the region.

3. That the operation of the law relating to atmospheric pollution be investigated with a view to restricting further (*a*) the emission of black smoke, (*b*) the emission of smoke other than black, (*c*) exempted trade processes, and (*d*) the emission of noxious fumes or gases.

Industrial

4. That plans for all new boiler plant and extensions to existing plant be submitted for approval to a properly constituted and competent authority.

5. That the properly constituted and competent authority have power to condemn for further use all boiler plant which cannot reasonably be adapted to consume its own smoke.

6. In schemes of Town Planning that full consideration should be given to the question of the prevention of air pollution.

Domestic

7. That only smokeless methods of heating be allowed in all newly constructed dwelling houses.

(*concluded on page* 110)

DISTRICT HEATING IN RUSSIA

The Development of a Planned System[*]

By A. E. Margolis

IT is generally admitted that in face of the scientific and technical achievements of our age the present methods of heating by burning of coal in every house or even every room are antiquated and that the waste of fuel due to these methods is enormous. It is also a well known fact that even in modern electric power stations about two-thirds of the fuel consumption is wasted, owing to the loss of heat with the cooling water. Therefore, according to the up-to-date engineering conception, the supply of heat ought to be centralised and co-ordinated with electric power generation. Apart from saving of vast quantities of coal, this development would completely eliminate the smoke nuisance, decrease the frequency and intensity of fogs and would facilitate the task of future town planning.

This development involves, however, a very great amount of investigating work, problems of reorganisation and of co-ordinated planning, and a considerable expenditure; and it is clear that these difficulties have been easily overcome in Soviet Russia.

In the spring of 1929, the author had the privilege of delivering a paper in Moscow on " Heatification and Electrification," and he also had the opportunity of visiting the first district heating plants in Leningrad and Moscow. The Russian expression " heatification," in analogy with the word electrification, demonstrates by itself the broad conception of Russian engineers upon district heating.

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[*] A more comprehensive article by the author was published in *The Steam Engineer*, February and March, 1941. The Kremlin photograph above by courtesy of the Society for Cultural Relations between the Peoples of the British Commonwealth and the U.S.S.R.

The development of district heating in U.S.S.R. was started from very small beginnings in Leningrad in 1924-25. In the summer of 1924, two pipe lines, of about 750 ft. in length each, were erected for the supply of a flat building and a public bath-house. The successful heating of these buildings and of a hospital nearby in the following winter encouraged the further extension of the heat distribution system. In the spring of 1929, 34 consumers were already connected, with a heat consumption of 180×10^9 B.Th.U. or 1.8 million therms in the heating season 1928-29, and far-reaching schemes for the heat supply of Leningrad have been contemplated.

In 1938 the total heat distribution system of Leningrad had an extension of 44 miles, and the total amount of the sent-out heat was in that year 3.3×10^{12} B.Th.U.

At the beginning of 1939 the total capacity of generating sets in U.S.S.R. with heat supply for space heating and process work amounted to 1,747,000 kw. and the total sent-out heat for 1939 amounted to 87.5×10^{12} B.Th.U. or 875×10^6 therms. The significance of this achievement is best realised by comparison with that of the gas industry in this country. In 1933 the authorised gas industries of Great Britain produced 293×10^9 cu. ft. of gas* corresponding to $500 \times 293 \times 10^9 = 146.5 \times 10^{12}$ B.Th.U. Taking an average efficiency of 60%, the actually available heat amounted, however, only to $146.5 \quad 10^{12} \times 0.6 = 87.9 \times 10^{12}$ B.Th.U., i.e., as much as the sent-out heat from the district heating plants in U.S.S.R. in 1939, after a development of only 15 years, a truly amazing fact.

According to the current five years' plan, 1938-42, the capacity of all thermal power stations had to be increased by 7 million kw. out of which 5 million kw. are to be installed with back-pressure or extraction turbines for heat supply. The power capacity of all heat-electric stations would have then been raised to 47.5% of the total thermal electric power capacity in U.S.S.R.

The Five Years' Plans

For the understanding of this remarkable development we have to visualise the special conditions in U.S.S.R. The technical development of the country and the standard of living in Russia before 1914 were far below those in Western Europe. It was but natural that after the destructions of the Great War and the Civil War the Government had to start with a reconstruction programme. The political statute of the Communistic Government with a predominantly theoretical scientific conception of technical and industrial development gave the reconstruction activities, since 1928 shaped in the form of five years' plans, an enormous impulse. With particular enthusiasm and vigour a large scale electrification programme of the country has been stressed, which has been outlined as the basis of industrial development and as the source of future welfare of the country. The then grandiose scheme of the State Commission of Electrification of Russia, known as the GOELRO scheme of 1920, which was much criticised as fantastic has actually been surpassed. So great was the belief of the Government in the agency of electricity for the economic and cultural reconstruction of the country that Lenin put it into the words, " Communism means Soviet Government plus Electrification."

District heating is in Soviet Russia a substantial part of the electrification programme. The main argument for combined heat and power generation, the great increase of the thermal efficiency with corresponding savings in fuel, is in Soviet Russia even more striking than in Western European countries. The climate is more severe and the demand for heating is greater. The existing heating systems, predominantly by stoves and only to a small extent by individual central heating plants, and also a considerable part of the factory boilers have on the average a very poor efficiency. The conditions are aggravated by the peculiar fuel position of Soviet Russia, with rich resources of high quality coal, but far from the main old industrial districts ; the nearest mines of the Donetz Basin being about 600 miles away from Moscow, and over 1,000 miles from Leningrad, and owing to the railway transport high quality coal is comparatively expensive. Therefore, and also because of reasons of defence, local poor quality fuel, such as sub-bituminous coal, peat, and shales is to be used everywhere as far as possible. The burning of these kinds of fuel can naturally be carried out much easier in big up-to-date power stations than in stoves, central heating boilers or small factory boilers.

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* Coal, its Constitution and Uses, by Wiliam A. Bone and Godfrey W. Himus, Longmans, 1936.

The introduction of district heating, however, has been considerably delayed. It was due to the lack of experienced engineers and of material, and to the preoccupation of the electricity authorities with the primary task of ensuring the required rapid increase of the electric power generating capacity. The erection of large heat distribution systems with a sufficient heat load would naturally have caused a great delay, and this fact has apparently strengthened the opposition of many power stations to the novel idea of district heating.

A Public Garden at the Square in the name of the fallen Red Armymen in Stalingrad.

Complete Heatification

As the turning point of district heating development can be regarded the First District Heating Conference of Soviet Russia, which took place in Moscow on 2nd-7th January, 1930. The Conference was attended by more than 800 delegates from all parts of the country, and it passed a strong resolution in favour of heatification of the country.

The honorary President of the Conference was Prof. Krzizanovsky, who after the war presided over the State Electricity Commission. In his inaugural address he pointed out that it was impossible to separate electrification from heatification. They were two services each of its own but combined into one science of energy generation and supply, the basis for the economic reconstruction of the country.

The President, Prof. Taner-Tanenbaum, in his general review on the prospects of heatification in U.S.S.R., gave an interesting analysis of the fuel consumption for the year 1927-28, showing that out of a total consumption of 96.1 million tons (on the basis of 7,000 kcal p.kg. or 12,600 B.Th.U. p. lb.) 55.5 million tons were used for heating and domestic purposes. Including the industrial requirements for heating and process work, not less than 81% of the total fuel consumption were used for generation of heat with a very low efficiency in heat utilisation. Hence the urgency of central station heating on the basis of combined electric power and heat generation.

The comprehensive resolution of the Conference consisted of 22 points, and contained detailed economic and technical recommendations for the development and organisation of district heating, a few extracts of which may be given :—

"The Conference considers that electric power generation in U.S.S.R. has primarily to be based on thermal stations generating electric power and heat as well; only the deficiency of electric power is to be generated in condensing stations."

"There should be no building of socialistic towns in U.S.S.R. without complete heatification."

"The Conference considers as indispensable the maximum utilisation of the existing industrial power stations for the heatification of neighbouring districts."

"The Conference considers as indispensable the working out of five years' plans for the heatification of U.S.S.R., especially of the big towns and of the industrial districts."

"The planning of heatification of U.S.S.R. is to be combined with the planning of electrification into one energy supply scheme."

These few extracts demonstrate the broad conception of the Conference on district heating. Correspondingly, the amount of investigating material presented at the Conference was very considerable indeed, especially in view of the short experience and the small number of industrial and public district heating plants which existed then in U.S.S.R. Not less than 28 papers were delivered which treated economic and technical questions of district heating and schemes for Leningrad, Moscow and many provincial towns. Mention is to be made to the general great enthusiasm of the speakers for district heating as a component of the electrification programme and beyond it as an important task of the new economic and political order.

The 1931 Decree

The introduction of district heating has been supported by the decree of the Government of June, 1931, advising that the future planning of electrification should take into consideration the erection of powerful heat-electric stations, first of all in the old and new industrial centres, such as Moscow, Leningrad, Kharkov, Tsheliabinsk and Stalingrad. This decree has ensured everywhere the aid of the Government authorities, and has evidently accelerated the introduction of district heating in U.S.S.R.

In January, 1939, the total number of district heating plants, including industrial district heating plants with heat supply to buildings outside, exceeded 160. The growth of district heating for the period 1929-39, is shown in Table I. The number of plants with live steam distribution, the stations having no back-pressure or steam extraction turbines, is given only for 1939 as being above 50.

In 1939 the public plants delivered 7×10^{12} kcal and the industrial plants 15×10^{12} kcal.

The electric power capacity of the public district heating plants amounted in 1939 to 16.8% of the total capacity of all public thermal power stations and the power capacity of the industrial heating plants to 28.5% of all industrial power stations.

Table I.—The Growth of District Heating Plants

	1929	1933	1938	1939
Total number of district heating plants with combined power and heat generation	14	53	90	106
Total number of district heating plants with live steam distribution, above	—	—	—	50
Total heat sent out, 10^{12} kcal.	—	5.5	20.46	22.0
From public power stations, included in the above, 10^{12} kcal. ...	—	1.99	6.2	7.0
Heat from turbines, 10^{12} kcal.	—	—	9.85	11.6
Heat from turbines, per cent.	—	—	48.5	53.0

Table II gives the main data of district heating of ten cities leading in public heat supply. The total sent-out heat from the stations in these cities amounted to $3{,}941.7 \times 10^9$ kcal in 1939, representing 18% of the total heat sent out from all district heating stations in U.S.S.R. in that year. Remarkable is the high load density and the high load factor, with low heat losses in consequence. For district I in Moscow the annual heat losses were given at 3%, and for district VI at 11.2%.

Very striking is the small number of consumers of 1,063 for all the ten leading cities put together. Of course, the number of connected buildings is higher; in Leningrad, for example, there were 295 consumers, with 464 connected buildings. The small number of consumers demonstrates how big the demand for heat is, and it indicates the wide scope of future development of district heating. It is noteworthy that

TABLE II.—MAIN DATA OF 10 CITIES LEADING IN DISTRICT HEATING

City	Started in the Year	Number of Stations		Length of the Distr. System		Range of Heat Supply	Max. hourly Load	Annual Sent-out			Max. Pipe Diam.	Number of Consumers
		Total	Heat Electric	Total	Hot Water			Total	Exhaust and bled steam			
				km.	km.	km.	10^5 kcal.	10^9 kcal.	10^9 kcal.	per cent.	mm.	
Leningrad	1924	5	3	70.68	63.1	2.9	216	826.3	566.9	69	400	295
Moscow	1930	8	6	52.95	42.2	3.5	510.5	1508	900	60	600	179
Ivanovo	1932	1	1	16.2	16.14	1.53	67	241	234	97	360	137
Kiev	1937	2	1	11.6	11.6	2.35	18.3	37	26.2	71	300	55
Rostov	1932	1	1	13.34	13.34	2.0	26.5	72	41.7	58	300	103
Kharkov	1932	2	2	11.8	9.9	4.5	51.2	212.5	91.8	43.3	500	66/86
Kasain	1933	2	1	2.5	0.0	1.08	78.11	524.2	334	63.5	350	9
Kuibyshev	1933	1	1	2.62	2.02	1.25	10.5	39.3	25.7	65.5	300	23
Saratov	1932	2	1	1.2	0.95	0.95	31.56	134	100	87	290	16
Gorky	1934	1	1	34	34	5.0	120	347.4	347.4	100	500	180
Total		25	18	216.89	193.2	—	1130.6	3941.7	2667.7	73	—	1063

the amount of heat sent out for the total of 1,063 consumers is equivalent to the amount of heat supplied by gas to about 1,800,000 average consumers in this country, with a distribution system of 9,900 miles as compared with a total of 136 miles for district heating distribution in ten cities of U.S.S.R. according to Table II.

From a total of 25 stations 18 worked as heat-electric stations and 73% of the heat was provided from these stations by means of exhaust heat or bled steam.

The prevailing heat distribution system is by means of hot water, and it is strongly advocated, mainly because of the higher electric power output. Steam distribution is mostly applied for factory districts, live steam only for the systems of comparatively small capacity.

In the construction and running of the district heating plants, especially with hot water distribution, many difficulties were encountered, and the frankness with which these are described and criticised in the Russian publications is admirable indeed.

* * *

Reviewing the outlined development of district heating in U.S.S.R., it must be admitted that this has been really very striking. The claim which is much stressed in Russian publications that U.S.S.R. is now ahead in development of district heating and is on the way of overtaking even U.S.A. can also be admitted. In contrast to the development in U.S.A., the Russians are striving to the general introduction of district heating, for all buildings of a town. For Moscow the extension of the district heating service has already been projected for 80-85% of the total heat demand.† A great advantage of the Russian development was the wide application of combined heat and power generation which the author has ever since been advocating as the basis of public heat supply. As Prof. Krzizanovsky said: "It is impossible to separate electrification from heatification; they were two services each of its own but combined into one science of energy generation and supply."

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† Journal, Teplosilovoye Khosiaystvo, December, 1940.

The Defence Bond Fund

A SMALL corner suffices, unfortunately, for the third list of donations to the Society's Defence Bond Fund. The Fund will remain open, however, and in thanking those who have helped to advance the total we should again like to draw the attention of others to its merits. The Fund is to help the Society to conduct an effective post-war campaign (this issue shows how we are starting to prepare for it), but in the meantime, through Defence Bonds, the contributions are directly helping the nation's war effort.

THIRD LIST OF DONATIONS

	£	s.	d.
Previously acknowledged ...	324	5	0
Dr. Frank A. B. Ward ...	5	0	0
Dr. R. T. V. Clarke ...	1	1	0
Warrington Corporation ...		10	6
J. S. Severs		10	0
Total (to Feb. 16th)	£331	6	6

Who's Who in Smoke Abatement

H. G. Clinch

THE name of H. G. Clinch has been well-known in the smoke abatement movement for many years, and has appeared above many articles in the press and in municipal and technical journals. Mr. Clinch is also one of the few who have broadcast on the problem of smoke.

Previous to the appointment he now holds as Chief Sanitary Inspector to the County Borough of West Ham, Mr. Clinch was Chief Assistant Inspector at Doncaster and then Chief Sanitary Inspector at Halifax. It was while he was in the north of England that much of his most active work against the smoke problem was carried on, with many lectures throughout the area. The West Riding of Yorkshire Regional Smoke Abatement Committee found in him an informed and energetic representative.

It was during this time that Mr. Clinch wrote and had published " The Smoke Inspector's Handbook," which remains one of the most practical and helpful of text-books on the subject. (It is published by H. K. Lewis & Co., Ltd.). He began to be recognised as an expert on the subject of industrial smoke prevention and was consulted not only by Local Authorities and their officers but also by the Governments of foreign countries.

During the years he has spent in London, Mr. Clinch has been a member of the Advisory Committee on Boiler House Practice to the City and Guilds of London Institute and a member of the Committee of the Greater London Advisory Council for Smoke Abatement. He was a founder member of the Institute of Fuel Economy Engineers and at one time a member of the Institute of Hygiene.

Mr. Clinch's firm conviction has been that smoke abatement can best be achieved by a constructive policy of education rather than by what he himself calls " the futility of attempt at solving the problems created through unregulated emission of smoke from factory chimneys, etc., by means of legal prosecutions and penalties."

This was the policy embodied in the many lectures to boiler men, plant engineers and industrialists at Chambers of Commerce, Rotary clubs, etc., and in the concise guide he prepared on " Hints for Boiler Attendants." He stressed the economy to manufacturers in the adoption of improved methods, and, as a result, many thousands of pounds a year were saved by firms which followed his teaching. Mr. Clinch's successful efforts in this field led to his being called into consultation by the then Minister of Health.

To-day the smoke abatement movement bases its case upon the fact that smoke can best be prevented by utilising fuel to the best advantage, and that efficient and economic combustion implies an absence of smoke. The development of this policy undoubtedly shows the influence of Mr. Clinch's forthright and uncompromising work.

Behind all his work for the movement there has been, as he has confessed, a compelling desire to remove the tragic necessity for the annual trek to seaside or country for fresh air and unobstructed sunlight, when these natural rights of mankind should, and could, be enjoyed on every day of the year in our home towns.

LOW TEMPERATURE CARBONISATION

in Reconstruction and Smoke Abolition

By Colonel W. A. Bristow, M.I.E.E., F.R.A.E., F.Inst. Fuel

WE are all only too well aware that the waging of total war demands nation-wide organisation of the most complex character. There is no room for uncorrelated individualism or a policy of *laissez-faire.*

When we have brought this war to a victorious conclusion, we will then be faced with another series of problems and the manner in which we solve them will influence our future to an extent that can hardly be imagined.

The task of reconstructing our lives from an economic, industrial, social and political standpoint can only be accomplished by the same well planned nation-wide organisation and determination as is essential for bringing the war to a victorious conclusion. It is therefore encouraging that the Government with its Reconstruction Committee is already considering our post-war plans, and is taking the opinions of experts upon some of the basic factors involved.

One of the most important questions will be that of housing, the amount of reconstruction already necessary is vast and by the end of the war it may be still more vast.

The question of housing is a much more complicated problem than appears on the surface. For example, what is the use of building a house in a certain manner in order to reduce the rent by 3s. to 5s. per week if at the same time the heating, cooking and hot water arrangements are inefficient and costly to operate, and any saving in the rent is thereby wiped out or even exceeded.

What are the main essentials in a house, whatever its size?

(1) Suitable and healthy site, proper foundations and a perfect drainage system.

(2) Ample supply of pure cold water and efficient plumbing throughout.

(3) Proper apparatus for smokeless heating and cooking at the lowest possible cost, and of such a type that the labour necessary for its operation and maintenance is reduced to a minimum.

(4) The provision of suitable flues for the efficient operation of the apparatus installed.

(5) Ample storage space, suitably placed for fuel, food and other essential stores.

Given these five essentials the poor man will be fundamentally as well off as his wealthy neighbours, always supposing, of course, that any of the latter still remain.

And yet how little some of these

essentials have figured in the scheme of things in the past. Literally millions of pictures of " desirable residences " have been dangled before the public since the last war, but in how many of these were embodied these five essentials ?

Essentials First

It would probably be found that even less than 10 per cent. of the houses built since 1919 contain all these simple and ordinary requirements and how many of us I wonder can think of even one house that is not impaired by some irritating defect or omission in respect to one or more of these five factors.

Indeed there are plenty of houses in which *none* of these five basic requirements have been properly met.

The attention of the public has been invited to the external appearance of the house and the unnecessary expense and inconvenience that would be experienced in having to live in it has been studiously kept in the background.

To build a house properly, the whole of the installation comprised in the five points should be designed first, after which the house should be fitted on and around these essentials. In a motor car the essential mechanism is designed and constructed first, after which the house or body is placed upon it, and the same principle should apply in house design.

At this point one might be tempted to enquire what all this has to do with low temperature carbonisation, but the answer is simple.

In the first place, in any scheme of reconstruction, we must insist upon the recognition of these five essential services, and all concerned must agree upon their vital importance, and determine to incorporate these first principles in the house of the future.

It is in relation to points (3) and (4) that low temperature carbonisation and its products can play such an important part. There are few to-day who do not recognise the evils both of smoke in the home and in the atmosphere of all our towns and cities. Our slogan should be, not smoke *abatement*, but smoke *abolition*, and although it is unfortunately impossible to secure abolition by the wave of a magic wand, there is no reason why our programme after the war should not be directed towards the ultimate fulfilment of this ideal.

Fortunately, for several years past supplies of smokeless fuel manufactured by the carbonisation of coal at low temperatures have been made available on an increasing scale, and to-day the outstanding merits of this class of fuel, providing it is properly made, are recognised and appreciated throughout the country.

It is smokeless, ignites easily, burns up readily, gives out intense heat and in addition to many other advantages, is economical in use.

This is confirmed by the fact that this class of fuel is mainly used in the smaller houses, and by those who have to study most carefully every item of their expenditure.

In a handbook issued by one of the leading gas companies is the following note (page 72) :—

> " These experiments upon the efficiency of . . . in use showed that " apart from the advantages of cleanliness, in avoiding atmospheric pollution, and the necessity for chimney " sweeping, low temperature fuel can " justify its higher price on the score " of its high thermal efficiency."

The report further states that the advantage of this particular fuel over coal in respect to thermal efficiency was 37 per cent.

In a report of H.M. Fuel Research Board (No. 3) there is set out a comparison of the efficiencies of coal and the fuel produced by low temperature carbonisation.

In the case of open fires low temperature smokeless fuel is shown to be 27 per cent. more efficient than coal, and 32 per cent. better than coal in the case of the small domestic boiler. These were the maximum figures but, in every case, there was a marked advantage.

There is no need, therefore, to urge the public to use this class of fuel merely *because* it is smokeless, it is in all respects an ideal fuel and has, in addition, the incomparable advantage of being smokeless.

Cooking and Heating

It is suitable for every class of apparatus in which coal can be burned. Open fires, closed and double purpose stoves, A.B., ESSE and Aga cookers, hot water boilers, in fact every type of household apparatus. Although in some cases it may be desirable to stock

A Refinery for Low Temperature Carbonisation Oils

two sizes, large and nuts, it is unnecessary to lay in any other fuel. This saves storage space.

This does not mean, however, that the makers of this class of fuel are satisfied with the heating and cooking apparatus installed in our houses to-day, in fact, in the majority of cases, the very reverse is the case.

Much has been done and is being done, but still more can be done to raise the standard of appliances above the level at which they have stagnated for a hundred years.

The subject of grate and stove design is far too large and important to deal with as a side issue here ; sufficient it is to say that with the apparatus that could be made available on a large scale after the war, the burning of smokeless fuels could be raised to levels of efficiency and economy much above those which are generally enjoyed to-day.

In addition, living conditions in the house, especially in the kitchen, could be improved beyond recognition, and the amount of household drudgery would be considerably reduced. This is not a laboratory vision, millions of tons of this class of fuel have been used in the last few years, and its possibilities are appreciated in almost every town and village throughout the country.

With regard to the structure of the house itself, two points have to be considered, the cost of accommodating the apparatus, the provision of adequate flues, and the amount of space taken up.

For example, in many rooms a great deal of space is monopolised with large and expensive grates, and wide and inefficient chimneys, whereas a modern type of stove, with a small chimney, could give far more heat for half or even a quarter of the expenditure of fuel and far less work would be involved in its maintenance. And, of course, at a considerable saving in the capital lost.

Coal and the Future

In addition, however, to these many important domestic advantages, there is the great national advantage that the use of this class of smokeless fuel ensures a far more economic use of the coal that must continue as the basis of all forms of domestic heat in this country.

After the war the price of coal may

continue to advance, and it is difficult to find any likely reason for a contrary opinion.

The number of men employed in the industry greatly decreased in the years before the war, and there are many to-day who consider that this shrinkage is likely to continue. In the North-Eastern coalfield films are being shown for the purpose of drawing the attention of the next generation to the advantages of working in the pit. Whether they will have the desired effect or not only the future will show.

It is, however, certain that we shall have to cease wasting coal as we have in the past, and the most efficient use of every ton we can raise will be a national necessity of the first order.

Here again the low temperature process has effectively demonstrated its usefulness and economic value.

In addition to the smokeless fuel, there is produced from a ton of coal two or three times as much useful oil as from the older processes of carbonisation.

The oil is also of a different type and in some respects more nearly resembles petroleum. It can be distilled, fractionated and refined and has for some years past been marketed on a considerable scale.

From it there are produced high quality petrol, Diesel oil, fuel oils, creosote and other well-known oil products. In addition, the crude oil is rich in tar acids. The phenols and cresylics are used in the most important industries in the country and these are also in considerable demand for export to the Dominions and America.

Almost every month a fresh field is opened up and it is difficult to see the end of this most remarkable development.

Already, however, it has been demonstrated that by a suitable process of low temperature carbonisation the products obtained from a ton of coal have a total aggregate value higher than that of the products obtained by any other carbonising process.

In the past it has been difficult to forge ahead with any new processes of treating coal, and it has also taken a long time to make the public show any signs of becoming smoke conscious.

Coal has been in plentiful and cheap supply, and the amount wasted in inefficient domestic appliances in the ten years prior to the war was well above 100 million tons. This will have to stop for many reasons which are obvious.

In addition, the change in our national financial position will necessitate the utmost possible utilisation of our own resources and we shall not be able in future to burn oil and petrol, and other valuable coal products in the domestic grate, and expect to replace them with foreign imports. To-day we are using coal oils in this country to the extent of many hundreds of thousands of tons per annum, and there seems no reason whatever why this output should not be still further developed after the war, with great advantage to the nation.

It is to be hoped also that the end of this war will also see the end of the jerry-builder and his works, and that at long last the people will be provided with well planned houses equipped with efficient and labour-saving heating appliances, and with a much higher standard of interior comfort and convenience which above all must be SMOKELESS.

In every department of this reconstruction programme the process of low temperature carbonisation can be of the utmost possible assistance; in fact it is not too much to say that the ideal programme cannot be fully realised without it.

West Riding Resolutions

(*concluded from page* 100)

8. That steps be taken substantially to reduce the cost throughout the country to the user of gas, electricity or solid smokeless fuel with a view to the ultimate elimination of the use of raw coal in domestic grates.

9. That the burning of raw coal be prohibited in other than specially designed grates which eliminate smoke, in all offices, warehouses, shops and buildings other than private dwelling houses.

Propaganda

10. That steps be taken to provide a wider instruction of the public in general and schoolchildren in particular in methods of healthy living in reference to atmospheric pollution.

The End of Smoke Abatement ?

WHAT'S in a name ? A rose by any other name would smell as sweet, but nowadays even a rose takes on a new and grander name if it is to win prizes and to have a good sale. So the rose of to-day becomes an *Etoile de Hollande* or an *Independence Day*. The *Home Guard* quickly replaced the *Local Defence Volunteers*, and now those familiar letters *A.R.P.* are found to be inadequate and are transformed into the more compact and complete *Civil Defence*. There seems to be much in a name.

Smoke Abatement is such a familiar phrase that it is perhaps accepted without thought by many of those who are interested in the subject it describes, but for a long time it has been looked upon by some as a weak and ineffective expression. Rather curiously, this dissatisfaction seems to have grown since the war has halted the progress of the work itself. If the descriptive phrase is indeed inadequate, then the name of the society is also inadequate, and the possibility of improvement will have to be considered.

We are not sure when the term smoke abatement first began to be used, but it was probably in the early part of the 19th century, when legal action against excessive smoke emission first began to be discussed. In law the word *abatement* is drastic enough, and means " to beat down, demolish, or destroy," but its uses in these senses is, according to the Oxford English dictionary, obsolete except in law.

Blacklock, in his *Commentaries* (1768) tells us that " the expression of abating, which is derived from the French and signifies to quash, beat down or destroy, is used in law in three senses. The first, which seems to be the primitive sense, is that of abating, or beating down, a nuisance . . . and in a like sense . . . of abating a castle or fortress." (The latter action seems to be covered at present by the new verb " to blitz " !).

If the movement for clean air is content to confine itself to the prevention of what the law is able to define and prepared to admit as a nuisance, then smoke abatement is a good and adequate expression. But if we want more than that, if our ultimate objective is precisely what is meant by *clean air*, and if we want this to be popularly recognised and appreciated, we have to remember that *abatement* in its literary and popular senses suggests only diminution—compromise, or in a way, appeasement. With reference to *evils*, among which smoke should surely be classified, the O.E.D. tells us that it means simply alleviation or mitigation, and this is borne out by the general literary use of the word. That great standard, by which we measure so much of the English language, the authorised version of the Bible, tells us : " After the end of the hundred and fifty days the waters were abated," and that " His eye was not dim nor his natural force abated." And that other inspirer of our native tongue, Shakespeare, exclaims in *Henry V*, " Abate thy rage, abate thy manly rage ! "

John Evelyn, whom we must consult, in one of his horticultural works advises : " During the hottest months carefully abate the weeds," but *Fumifugium* has no reference to smoke abatement. More positively and logically he pleads for the " melioration of the air."

There is little doubt that to-day the phrase suggests not the attainment of smokeless air, but merely the moderation of smoke to a less objectionable level than it was before. There is no flavour of abolition, and still less of prevention.

Is it Persuasive ?

Even so, it may be asked, is there any need, or any purpose, in wishing to suggest something more drastic than abatement ? May it not be preferable to create an impression of moderation and gradualness in tackling this problem of the pollution of the air ? Is it not more persuasive to talk about the " abatement " of smoke than its " abolition " ? It may be so, but as a rule it is preferable to ask for more than you expect than to ask for less. Smokelessness, complete and universal, may still be a distant target, but it is surely better to aim at that than at the half-way mark implied by mere abatement ?

A Society for the Abatement of Slavery would have seemed a weak and insipid organisation compared with that for the Abolition of Slavery, and we doubt if the Society for the Prevention of Cruelty to Children would have had its success and support if it had been content to ask only for the Abatement of Cruelty to Children. Nor would the Prime Minister inspire the nation in his usual way if he came to the microphone to tell us that our job was to ensure the abatement of the menace of Nazism.

The fact is that when smoke abatement first began to be demanded complete smoke prevention seemed an impossibility. It was, of course, an impossibility in those days. To seek for a moderation of the smoke was the only practicable course. To-day, smoke is an anachronism. It is feasible to look forward to its complete and final abolition. Yes, there is a long way to go, but the movement towards it has started and will continue. Compared with the past, a considerable *abatement* of smoke has already been achieved. But there is still smoke.

So there seems to be good grounds for throwing the word overboard. It is a poor, dull word anyhow and we would quickly learn to do without it. (Believe it or not, but it has caused the Society to be addressed as the " Smoked Bacon Society " more than once).

Abolition ?

If a firmer word is sought for *abolition* first comes to the mind. It is bolder, but is it the right word ? Somehow or other it does not altogether satisfy. It, like abatement, has an old-fashioned ring about it, and while strong enough does not altogether seem appropriate for a process that is dependent upon scientific and technical development. It savours perhaps of politics or moral issues, and also seems to imply doing away with something that exists, while the only way of tackling smoke is to *prevent* its existence. So we come to the idea of *smoke prevention*. It is more direct and logical. Hence, no doubt, the Smoke Prevention Association of America, a voluntary body not unlike our own, and in this country the firm of Smoke Prevention, Ltd. A *National Smoke Prevention Society*, or some modification of this. certainly has its points.

" But why be so narrow ? " some readers will, we know, ask at this point. " Pollution is not caused by smoke alone, and when smoke has been effectively dealt with the other forms of pollution will be more noticeable and require tackling—dust, fumes of various kinds, vehicular exhausts, and so on. If we are looking ahead we ought to be a *Society for the Prevention of Air Pollution.*"

This seems to be a good point. It is an improvement except, unfortunately, in length. And that is a not immaterial obstacle.

" Precisely," we hear another voice, " and that is because you are expressing a negative idea. The positive is more compelling as well as being shorter. The objective of the Society is to ensure pure or clean air. Why not say so ? "

There is substance in this. It has, we think, been considered before, and in a special form it cropped up when a search was being made for a title for this journal. But the curious point is that no satisfactory adjective for a positive description. A vagueness creeps in, a kind of foggy inexactness, when we try out such a name as *The National Society for Pure Air*, or the *Clean Air Society*. These, presumably the correct terms, seem to have, for some subtle reason, an unwanted connotation—something woolly and crankish about them. Perhaps it should not be so, but there it is. Some philogist might be able to tell us why.

More ponderous, but gaining in syllables as much as in precision, would be the *Society for Air Purification.*

In passing, we may say that the U.S.A. organisation largely concerned with industrial air purification problems opened up new ground when it called itself " The Air Hygiene Foundation of America." But, even if we added to our American borrowings by helping ourselves to this phrase, would we get used to, say, *The National Air Hygiene Society* ?

It is an interesting topic, not of any urgent importance, but perhaps worth considering even now because after the war a stronger and more determined title for this work and for the organisation concerned with it, might well give it added vitality and impetus. Smoke Abatement definitely does seem to belong to a past era, but what should replace it is clearly not an easy question.

It is a problem on which we invite our readers to exercise their wits.

(T.10)

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SMOKELESS AIR

The Smoke Abatement Journal

Wartime Issue No. 11 **Summer, 1942**
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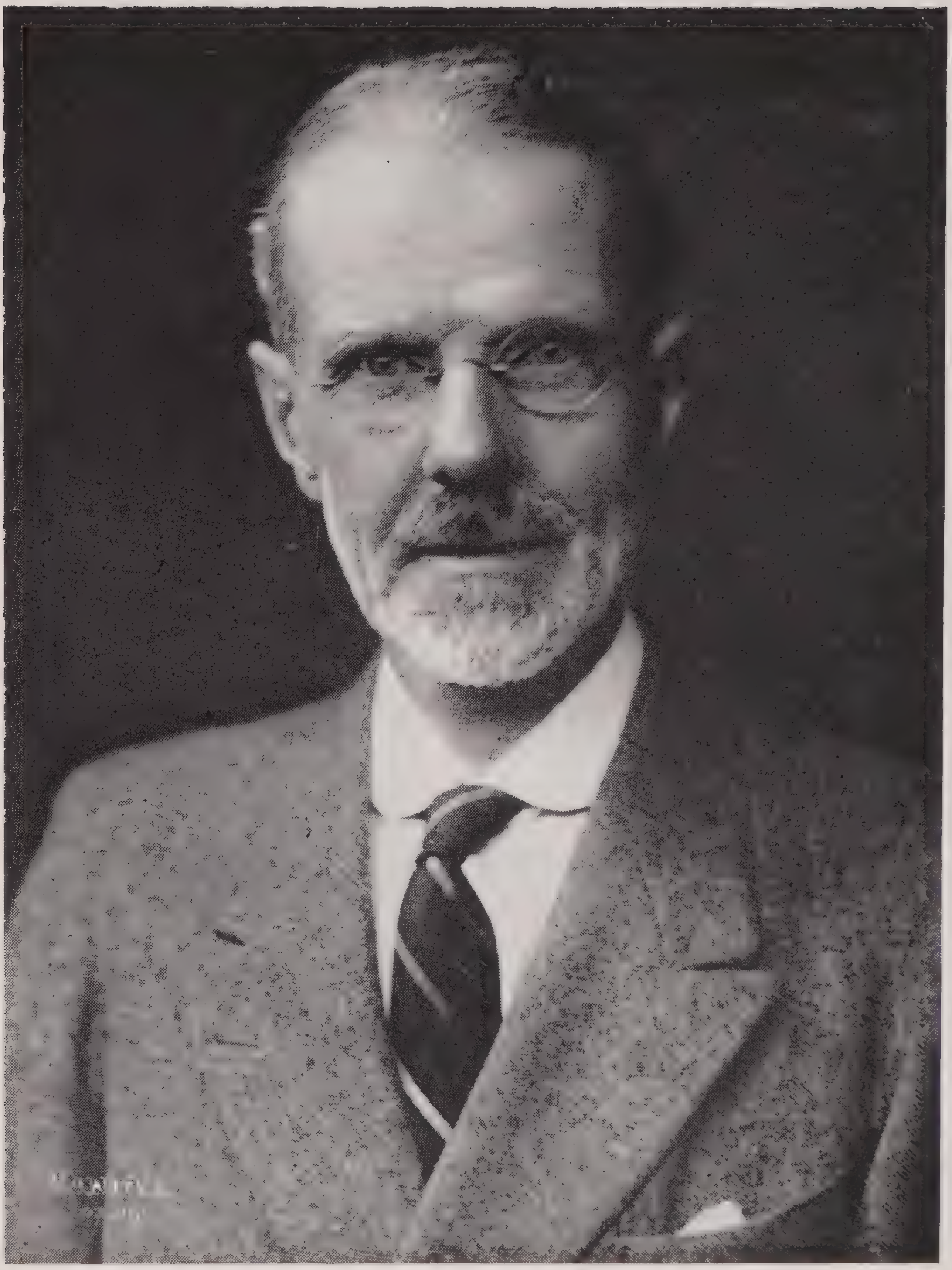

Harold Antoine Des Voeux
M.D.BRUX., M.R.C.S., F.S.A.
First President of the National Smoke Abatement Society
Died 20th May, 1942

THE LATE
HAROLD A. DES VOEUX, M.D.

By
Sir Lawrence Chubb

BY the death of its President, Dr. Des Voeux, the National Smoke Abatement Society has suffered a grievous and irreparable loss, and the whole movement for cleansing the air from avoidable pollution has been deprived of one whose eloquent voice and pen were amongst its greatest assets and whose enthusiasm for the cause was a source of inspiration to others.

For upwards of forty years Dr. Des Voeux had made coal smoke abatement his chief interest. To it he devoted himself with all the energy and patience at his command, coupled with a cheery optimism which never allowed him to be daunted by difficulties that might well have discouraged a lesser man. When the time came for the fusion of the old Coal Smoke Abatement Society (of London) and the Smoke Abatement League of Great Britain (of Manchester) into a single body framed on national lines, there was no doubt in the minds of the members of both organisations as to the right person to elect to the position of President. Dr. Des Voeux was marked out for the honour and his unanimous election was a foregone conclusion. From year to year his re-election followed as a matter of course, and all who have attended the many conferences and meetings convened by the Society and over which Dr. Des Voeux presided, will recall with what distinction he invariably carried out the duties of Chairman.

The presidential addresses of Dr. Des Voeux bore evidence of his profound knowledge of every phase of the subject of smoke abatement. They were well-conceived and happily phrased. They made their hearers think, and reflected their author's deep-rooted conviction of the righteousness of the cause he was championing and his faith in ultimate success ; and they manifested, too, his practical outlook and shrewd common-sense, attributes which were his to a marked degree.

Dr. Des Voeux's interest in smoke abatement first began to show itself when he became a member of the Westminster City Council in the closing years of last century. The smoke prevention provisions in the London Public Health Act, 1891, were based on similar sections in the Public Health Act, 1875. Their application was so cumbrous and uncertain that few efforts had ever been made by any Metropolitan Borough Council to enforce them. The task of proving that smoke complained of was, in a technical sense, black in colour and emitted in such a quantity as to cause a nuisance, was difficult, and the alternative method of endeavouring to prove that the boiler installation was inadequate or inefficiently worked was open to technical lines of defence that made attempts to secure a conviction hazardous in the extreme. For these reasons and in the absence of co-ordinated public opinion, the smoke nuisance provisions had virtually become a dead letter.

Dr. Des Voeux, however, felt that something must be done and it was not long before he was able to persuade the Westminster City Council to institute a vigorous campaign. Although several successful prosecutions of glaring offenders led to convictions and established valuable precedents, few of the other Borough Councils followed the lead of Westminster. Thousands of factory and other commercial chimneys in Greater London were free to pour filth into the air, and every winter smoke-laden fogs made life almost intolerable. For three or four months of the year sunshine was almost unknown. Public health suffered; property of all kinds was damaged and traffic was brought to a standstill. But although everyone experienced the inconvenience of the smoke-laden fogs and suffered from its effects, they were accepted as an unavoidable evil. People grumbled but took no action.

It was not until 1899 that any concerted effort was made to grapple with the nuisance. In that year, a small but influential group of public men, under the leadership of the late Sir William Richmond, R.A., determined that something must be done. They founded the Coal Smoke Abatement Society of which, from its inception, Dr. Des Voeux was Treasurer. He took a leading part in the direction and development of the work of the new organisation. The Executive Committee met at fortnightly intervals at Dr. Des Voeux's house in Buckingham Gate, and from the time I was appointed Secretary in 1902 until the amalgamation with the Smoke Abatement League took place, he attended the meetings with amazing regularity.

It is interesting to look back and recall some of the outstanding developments of the long campaign with which Dr. Des Voeux was specially identified.

It seemed to the Society essential that the attention of the Borough Councils concerned should be systematically drawn to the existence of nuisances. None of them had special Smoke Inspectors, and the Society decided to appoint a trained man to make observations; another was subsequently engaged. The Inspector's task was to watch premises in Greater London in respect of which complaints had been received or when he observed the existence of smoke nuisances. His reports, after consideration by the Committee, were forwarded to the local authorities concerned, and in some years numbered 1,500.

At first, the Society's intervention was regarded by many Councils as a manifestation of officious zeal by a group of faddists. Some of the Councils went so far as to say that they regarded factory smoke as a sign of commercial prosperity and they wanted to see more of it.

Slowly but surely, however, this negative attitude was broken down, and the time came when the Society was frequently asked by Councils to send an Inspector to make joint observations with their own officers and to support them by evidence in the Police Courts. Gradually, and with few exceptions, Borough Councils took up smoke abatement as one of their regular functions, and in normal times now it is rare to see in London factory chimneys emitting dense volumes of smoke to which exception can be fairly taken. The change has been remarkable and is attributable to the long and persistent efforts made by the Society under the leadership of Dr. Des Voeux and his colleagues.

Another important feature of the early work in which Dr. Des Voeux played a leading part in association with the late Dr. John Owens and with the *Lancet* was a series of tests of grates, gas fires, cookers and solid fuels, carried out under the auspices of the Office of Works and Public Buildings. The Department placed a number of rooms in Government buildings at the Society's disposal for these tests. Large numbers of grates were scientifically examined, tested and reported upon from the points of view of thermal efficiency and smokelessness. Although it was proved that it was impracticable to burn bituminous coal in an open grate without generating smoke, it was established that certain types of grates gave infinitely better results than others examined in similar conditions; and the tests led to a great improvement in the design of grates. So far as gas fires are concerned, the tests did much to remove popular prejudices against this form of smokeless heating. The improvement in domestic heating and cooking arrangements which has taken place since the Society commenced its labour has been really remarkable and has undoubtedly led to a great reduction in the output of coal smoke.

The various Exhibitions and Conferences arranged by the Society under the direction of Special Committees, of which Dr. Des Voeux was Chairman, also exercised a potent influence on the formation of a healthy public opinion. It is difficult now to realise that at the electric kitchen and dining-room installed at the International Smoke Abatement Exhibition in 1912, was seen the first large-scale public experiment in cooking by electricity. Thousands of people visited the dining-room in order to test for themselves whether the new method of cooking had any effect on the flavour of the food.

Another outstanding achievement was the struggle of the Society to secure the amendment of the law with regard to smoke nuisances. It was not until 1926 that a Bill was passed into law under the title "The Public Health (Smoke Abatement) Act." This measure, as placed on the Statute Book, differed in many respects from that drafted by the Society, but it was based on our suggestions and incorporated many of them. That the position of the public as regards smoke nuisances has been greatly improved by the Act cannot be gainsaid, but the real value of the measure will not be known until the Ministry of Health can be induced to allow local authorities to take full advantage of its provisions by making byelaws applying to smoke that is not "black" in colour. Black smoke had already been under control since the Public Health Act, 1875, became operative. What is needed is power to deal effectively with other smoke which, in fact, is inimical to health and property and which injures the amenities of town life.

Dr. Des Voeux took a prominent part in the work of the officially appointed Atmospheric Pollution Committee, which was set up under the direction of his old friend, the late Dr. John Owens, as well as in the formation of Regional Smoke Committees created under the provisions of the Smoke Abatement Act.

It is not often given to reformers to see the results of their efforts, but although the coal smoke nuisance has not yet been abolished, it may be fairly said to have been reduced to an encouraging degree. Dr. Des Voeux lived to see the striking improvements for which he was so largely responsible. Forty-three years ago when the Coal Smoke Abatement Society came into existence, the public were lukewarm, if not incredulous. Masses of smoke were accepted as a sign of prosperity. Now, they are regarded as a proof of avoidable waste; then, few local authorities took seriously their duty to prevent smoke nuisances; now, all the larger Councils employ trained Smoke Inspectors; then, nearly every private house used the old-fashioned and extravagant range for cooking; now, at least in towns, electric and gas cookers have taken their place; whilst gas and electric fires and methods of central heating have displaced the former open fires, especially for occasional use. These changes have done much to give back the blessings of a pure air, to increase the hours of beneficial sunshine, and to render more pleasant the conditions of life in our large cities.

When the time comes to write the history of the Smoke Abatement movement, the name of Dr. Harold Des Voeux will find, as it surely deserves, a high and honoured place in the ranks of those who did so much to bring about a cleaner atmosphere.

Dr. Des Voeux was staunch in his friendship, loyal to his colleagues and staff, and filled with an unswerving faith and optimism. He had all the qualities of a leader capable of coming to a quick decision, but yet always considerate of the opinions of others. The early days were full of difficulties. The public were always lukewarm and never willing to give adequate financial support to the Society, while smoke abatement enthusiasts were regarded as dreamers, if not impracticable faddists. The inflexible determination of Dr. Des Voeux to carry on in the face of such difficulties had its reward, and he lived to see accepted the principles upon which the movement was based. In all his wide circle of friends, none will more sincerely mourn his passing than those with whom he was associated in his life-work of trying to secure for mankind the blessings of a pure air.

Dr. Des Voeux, who was born in 1861, was educated at Wellington College and received his medical training at St. George's Hospital, after which he took his M.D. degree at Brussels. In the words of the *Times*, "his technical skill and remarkable diagnostic ability soon gained for him a large practice."

"THE PRESIDENT'S ADDRESS"

Some Notable Passages

TO most members of the Society, Dr. Des Voeux will be remembered as one of the central pivots around which the Society's annual conferences turned. Not simply because he was President, but because, as President, his keenness about the job we had met to discuss, and his good-humoured vitality, helped to create that friendly, practically-minded spirit that made the conferences events to be looked back upon with appreciation and forward to with expectation. After the early years in the wilderness, when a snub was about all that could be expected for a smoke abatement conference from a City Council or a Lord Mayor (and was in fact not unknown), Dr. Des Voeux realised, more keenly than most of us, the tremendous change in public and official opinion that was reflected in the civic receptions with which, in these latter years, our conferences have been privileged to open. To the President, who had sown the seed long ago on the stoniest of soils, this recognition was indeed a happy flowering.

And then with a Shavian disregard of the conventional word, there might be some flashing, penetrating remark about the city or its people that would cause a furore in the local press, greatly annoy the people who needed to be annoyed, and generally make the public think more about smoke abatement than ever they had done.

Such episodes gave a sparkle to the conferences, but the President's finest contribution to making those events so successful and invigorating was, of course, the Presidential Address he delivered each year. Looking through the press reports of that Leeds conference (and how voluminous they seem to-day) one notes the beginning of the *Manchester Guardian's* two column account of the opening sessions :

" The Conference began on a note of scholarly aspiration. . . ."

That, of course, was Dr. Des Voeux's address, prepared as always with much thought and, one felt, not a little anxiety. These addresses were indeed inspiring, kindling in others, with their sincerity, the same burning idealism and purpose that was so evident in their author. They were learned, they were witty, and permeated by a broad humanism and longing for a civilisation that was decent, clean and lovely. They expressed the higher and rarer wisdom of the true physician, the healer. They were, in short, reflections of the warm and generous personality of their author.

It will be appropriate and perhaps stimulating to reprint some of the outstanding passages from three of these addresses.

Bristol—1935

" This freedom we are now discussing has been terribly abused since the commencement of the great industrial age. The aggregation of manufactories in suitable places—suitable on account of the proximity of coal and iron to our sea coast and its harbours—caused in intensification of population, attracting the poorer agricultural labourers to those centres which offered them higher wages and more continuous work, unavailable in more sparsely populated districts.

" But individual freedom called forth no united action to avoid overcrowding, bad housing, or control over atmospheric pollution. Hence we have the stubborn and onerous problem of dealing with these matters at enormous expense and against the active opposition of interested parties. At long last this great wave of resistance is breaking on the shores of public conscience, and subsiding. We have for a hundred years or more been clustering like sardines in a tin under the smoke pall of our 'enlightened' cities, and admiring our superiority over primitive man, who, I am told, often thinks of our boasting about our civilisation as so much hot air. We who have had at our command all the wisdom of the poets and ability of scientists, should surely be able to refute the charge of barbarism. But what would the denizen of another planet think of a race which callously allows the filth of smoke to be regarded as a natural element? 'Barbarous,' he would say, and apply his handkerchief to his nose to filter out the offensive and irritating emanations. Primitive man sitting in his cave in a cloud of wood smoke was not so foolish. He took an intelligent interest in smoke and had his theories about it. And so have his descendants to this day (see *The Golden Bough*).

"These people had some logic in their creation of smoke—we have none. We do not believe that smoke will create rain, or that it will make us inspired prophets, and we know that agriculturists find smoke the reverse of beneficial to crops. We can claim that the miasma hovering over our cities brings devils and witches tumbling from the clouds—in the shape of disease and dirt, but the descent is more harmful to the inhabitants than the witches. Primitive man had therefore a social conscience, for his rites were intended to benefit all, while we are content, if the smoke does not come to our faces from a downdraught, that it injures our neighbour and not ourselves.

"It is over thirty years since our Society commenced the preaching of clean air, and though much has been accomplished in that time, we have still a long way to go before our ideal is reached. Legislation can do good, but the great good can only come from education; education which will teach every inhabitant of this country that smoke in the atmosphere, from any and every service, is a sign of wasted coal, and that it is not only destructive to our great buildings, our vegetation, and everything that we possess, but it is a signal that barbarism is still in our nature and that with all our education and civlisation we are unable to appreciate that smoke is not a product of nature, or a natural constituent of the atmosphere, but that it is created by man for his comfort and convenience, and that it is our want of recognition of what is true civilisation which allows this fouling of our atmosphere without an attempt at its prevention or even reduction.

"A slow change seems to be occurring, but it is slow and faltering, and he must be a persistent optimist who can to-day visualise the beautiful manufacturing city of the future, built and designed not only for the making of money but for its educative value on the young lives of the future; beauty to be seen in the streets and in the houses; beauty and cleanliness which will be steeped in the blood and bones of children; beauty in surroundings which can never be forgotten, and by which they will learn that dirt and ugliness are a sin against nature and art, and which will guide them to future health and happiness. Not until that day dawns can we assert that we have thrown off barbarism and become civilised."

Leeds—1937

"All nations, from the beginning of history, have had their ideals. Even among savage races principles of hygiene and prophylaxis are observed, which, though they may be wide of the mark when judged by modern scientific standards, are usually elaborate and certainly sincere. . . Cleanliness was an ideal with the ancient Greeks, as their open cities and their temples to Aesculapius, Hygeia and Panacea showed. The temples of Aesculapius, commonly situated on wooded hills or mountains near mineral springs, were nothing less than hospitals where the sick, attended by physician priests, were treated by bathing, massage and sleep. The Romans, too, with their baths and aqueducts, were apostles of clean cities and citizens.

"How was it then, that with these ancient ideals of cleanliness, personal and civic, before them, Europeans of the middle ages slipped into a disregard of hygiene so profound that we cannot remember the splendour and romance of those days without an ironic afterthought of filth, primitive sanitation and foul smells? The change from a love of cleanliness to its disregard is one of the strangest that man, in all his vagaries, has ever allowed. It was a change induced by apathy, not by a lack of idealism but by a passionate clash of ideals in which cleanliness failed to find acceptance upon the side of the angels. To us, to-day, science and religion no longer seem at war.

We seek trust as best we can in every field which lies open to us, nor feel that in doing so we are offering an affront to the things of the spirit. But in the middle ages the position was very different . . .

" In addition to the enchainment of learning, the Church brought with her a mystical ascetism, derived from the East, disdainful of carnal things. Mind and matter were separate entities. The spirit was eternal, the poor body but the dust which housed it; to be scorned and, as far as possible, ignored. It was this contempt for the body, and for the things of the world, which led to the strange divorce of cleanliness from godliness, and which, so Clifford Allbutt tells us, " in a few generations turned the cleanest people in the world into the most filthy."

" What use, men thought, to expend much labour upon a world in which they were but brief sojourners, born to trouble as the sparks fly upward. So the cities of the middle ages were middle ages were magnificent fortresses, abominably drained and the roads were miry tracks where refuse was flung. Epidemics and plagues swept the country and were regarded as visitations of God for sin. Even the Renaissance with its tremendous stimulus to learning could not shake ideas so deeply implanted in the hearts and habits of the people. Dirt and disorder were tolerated as necessary evils, and if smoke was not classed among the greatest of these it was simply because wood smoke is less offensive than coal smoke."

" The industrial nineteenth century," continued the address, " did little to improve matters, rather the reverse; for though the paving and cleansing of streets became more common, the town sucked in population from the countryside. Overcrowded slums added to the squalor of cities where the emissions of factory chimneys were blackening the air with soot and eating at the stone of ancient buildings.

" Can we, to-day, pretend that we have recovered the ancient Greek ideal of clean and open cities? Even now we tolerate in our midst the existence of slums whose vermin-infested hovels are breeding-grounds for disease. We are still content to live in cities which are periodically blotted out in fog, and permanently wasted by sulphur-bearing fumes. Content? If we are content with this we may as well be content to live in the pig-styes we deserve, and have done with it. Whatever our views on life and death it ill becomes us to leave our world to posterity in the same unkempt and grubby state in which we find it."

Cardiff—1938

" I have referred to the mediaeval towns which within their walls were laid out so as to be self-sufficient in wartime. One might base on that a theory for our modern towns. One remembers Aristotle's description of the city state as of people living together in organised community partly for convenience and partly to live the fullest life possible. The dirt of industrialism has now made the town a place to escape from. Men live more and more in such towns to earn the competence which will enable them to escape. But this is a very futile ambition. Towns should be able to provide all the necessary amenities for the good life of the Greeks, and make the agonised exodus that marks the week-end and turns roads into caterpillar extensions of towns, unnecessary.

" Towns which have grown up as they have done in the last hundred and fifty years have become places to shun. Sanitary services may be better organised, but the smoke that befouls the air, the discharges from exhausts that sicken the stomach, the unceasing din that shatters the eardrums have made them places where life in the Greek sense is impossible. Those people who are fortunate enough to have ample leisure spend it in the country, and the town-dweller is perforce an escapist. If our civilisation is an escapist one, it is because the prospect of combining the healthy town in the physical sense with the healthy town in the spiritual sense has been lost sight of.

" The abhorrence of the town which characterised the romanticists of the early nineteenth century has become a kind of obsession, which can be understood but which is an evasion of the fundamental problem.

" Towns are still places which must be lived in, and if our civilisation is to be an urban one, then its difficulties should be faced. The abolition of the smoke nuisance is not the least of these."

The Post-War Home

From a Paper by

Alfred C. Bossom, F.R.I.B.A., M.P.

The twelfth of a series of lectures on "The Post-War Home: Its Interior and Equipment," arranged by the Royal Society of Arts, was given by Mr. Bossom on May 27th. The speaker summed up the views of the previous lecturers and declared that he was one of those whose conclusions amounted to an increasing determination to obtain a happier, fuller, and richer life for the greatest possible number. Mr. Bossom then continued as follows:

IT will be impossible to reach this goal if existing limitations, restrictions and obstructions have not been removed by the time the war ends; and this means, though they may have been of use in their day, laws and regulations which now crimp and cramp, MUST GO. It matters not whether it be a departmental or a municipal authority who is responsible for the creation or administration of such control, if they obstruct beneficial progress, they must be corrected—mere tinkering or further palliatives will not satisfy, and legislative cheese-pairing in this field must be resisted to the utmost. This may involve a small Treasury loss, but, if it means the enrichment of post-war and succeeding generations, the Treasury, as the custodian of our national assets, must meet the desires of the majority. The nation's wealth is its people.

* * *

Agreed on the minimum size of the average house, the next problem is to make living within it as easy as possible—in other words, eliminating avoidable work. What is the basis of most work? Heating, cooking, sewing and cleaning, and all these can be given the benefit of the latest scientific research. Although the cheerfulness of the open fireplace demands the inclusion of one at least in every household, the major source of heating should be by either electricity, gas, communal steam or oil. That old bug-bear, clearing out grates or carrying coal, must be ended. In this country, thermostatic control is never found in smaller houses and very seldom in the larger; but if properly installed, this would more than save in fuel consumption alone in the first year or so, its initial cost of installation. Heating services for either warming rooms or cooking food should be controlled simply by a switch—no matter whether it be by electricity, by gas, by steam from a municipal heating plant, or from an oil furnace in the basement. These services are, of course, already provided to some degree for lighting, sewing and constant hot water, but can be greatly extended to include all houses in our reconstruction period, and I look forward to the time when the moving of the thermostatic indicator need be the only effort required of the household chancellor of the exchequer, mother, to get every service she requires; but above all, she must be freed from the drudgery of interminable heating and cooking.

The provision of thermal units from a distant source for every house also calls for a similar improvement in our methods of insulation. The leakage of heat through walls, ceilings, windows and doors can be avoided by good design and proper construction with the appropriate insulating materials. The walls of to-morrow's home should be akin to the sides of a refrigerator so that winter's cold and summer's heat can both be kept in their proper place, while the interior of the house can be either hot or cool according as its occupant desires! All doors and windows should be fitted with weather stripping and this application of insulation to the living unit, the home, will pay a handsome dividend by ending the present needless wastage of heat which, to-day, costs the nation millions of tons of coal, coke or wood a year, and which are now burnt without the desired results to those who foot the bill!

THE MINISTRY OF FUEL AND POWER

The End of the First Coal Age?

THOSE steadfast and resolute qualities of this nation, which have so often saved it from grave perils, are never more pronounced than when we are refusing to exercise the foresight by which those perils may be avoided.

H. G. Wells, so unorthodox in his concern about the shape of things to come, somewhere suggests that there should be a Ministry of Foresight. It is difficult to imagine agreement being reached for the creation of such a Ministry, and it is doubtful whether it would make much difference without wide powers to override the opposition it would constantly engender. To-day, perhaps, there might be more support for the proposal, for the shortcomings and delays in the deployment of our war power are vivid indications of the value of conscious foresight—not to mention the even more disturbing thought that foresight might even have prevented the war.

A Ministry of Foresight would, it is certain, have grasped the importance of a scientific and comprehensive co-ordination and development of fuel production and utilisation. It would have been seriously concerned about what is meant by Coal Conservation, and would have seen how much the future of this country will depend upon the way we safeguard the dwindling riches of our coalfields. It would have understood the changes and advances that are taking us from what we may call the First Coal Age, the age of primitive and reckless coal consumption, towards a Second Coal Age, an age of maximum scientific utilisation. It would, many years ago, have established, as a major department of State, a Ministry of Fuel and Power.

Many men with wise understanding of the nature of the coal problem have urged the creation of a Ministry of Fuel and the formulation of a broad, inclusive national fuel policy that would ensure the best use of every part of every pound of coal mined. This demand, we are glad to be able to record, has been supported by the National Smoke Abatement Society, which has seen that through such a policy will come the ending of the gross wastage of coal that is the cause of the smoke evil.

And now, at last, we have a Ministry of Fuel and Power, born, however, not out of Science by Foresight, but out of Crisis by Total War. We welcome the new arrival, we see a great future for it, pledge it our fullest support and wish it God-speed in its growth to a bold and imaginative maturity. True, we wish its parents had been different, and that it had not to start herculean tasks at so tender an age, but hope that heredity will not influence too markedly its future character and stature. We hope, too, that it will grow strong and independent enough to withstand the grave dangers to life that beset new Ministries when immediate dangers are past.

We have spoken of the First and Second Coal Ages. The first, beginning when the first ships from Newcastle unloaded their cargoes by Sacoles Lane in the City of London, was the age of cheap and plentiful coal, mined and burned without discrimination or understanding. It was a careless, pioneering age with slow and fumbling technical advances from the primitive towards precision control and the scientific upgrading of an increasingly precious raw material. The first coal age saw a reckless squandering of an abundant fuel; the second will be marked by controlled utilisation and jealous conservation of a source of energy that is fast dwindling away. The first was an age of waste; to the second waste will be anathema. One of the most unpleasant and costly by-products of

"The gross wastage of coal that is the cause of the smoke evil."

the wanton waste of the first coal age was, of course, the smoke evil. One of the blessings of the second coal age will be that our towns and cities will enjoy cleanliness and pure air.

To-day we are at the difficult transition stage between the two ages. Primitive and scientific utilisation are found side by side, though as yet with the primitive still outweighing the modern. The result is that we are having to wage totalitarian warfare, of which the key factor is production, on fuel utilisation methods that are largely obsolete, and we are finding it all very difficult. The Ministry of Fuel and Power should have been created twenty years ago, and by now we should have, and easily could have had, a planned fuel policy, fully co-ordinating every aspect of the problem, and giving us a scientific development of heat and power production with an adaptability and potential capacity far in excess of anything we can hope for from the present piecemeal economies and deprivations.

We hope that the moral of this will come to be appreciated by the new Ministry, and that it will see that this urgent wartime emergency is not an isolated event but is an acute and special manifestation of deeper and more complex problems.

The Ministry will have its hands full with its immediate and critical wartime tasks, the seriousness of which cannot be over-emphasised. But these are only the prelude to its subsequent responsibilities. Even among the perplexities of guiding (or scraping) the country through its present predicaments there is the opportunity and the need to begin the study of the problems beyond, and for the Ministry, bravely adopting Foresight and Science as its foster-parents, to open up the road that will lead us to the Second coal age. It can help not only to bring the nation nearer to winning the war but can make possible those conditions of heat and power production without which not only the welfare of the mining industry and of all the fuel industries, but the whole of our future economic prosperity will be most gravely prejudiced. A hundred years from now our country may be thankful that the fuel crisis of 1942 brought into being a wise and farseeing Ministry of Fuel and Power.

News and Comment

ALL readers, but particularly Smoke and Sanitary Inspectors, will be interested in the following letter, which was sent to the Mayors of cities maintaining smoke abatement departments by the Director of the Bureau of Mines, U.S. Department of the Interior (the State department corresponding to our own Ministry of Fuel and Power):

In the National Defence project of the conservation, allotment, and distribution of solid fuels throughout the United States, it appears probable that operating difficulties in fuel burning plants will arise in various cities. These difficulties will develop if there is a shortage of supply in the customary fuels and substitute fuels must be used. The solution of such difficulties will require technical help and also factual information on local fuel burning equipment.

The Smoke Abatement Bureaus of the city governments have personnel with experience in fuel burning, and also a knowledge of the local fuel burning equipment. The carrying out of the technical side of the general programme would be greatly helped if engineers of the Bureau of Mines could establish contact with the head smoke abatement engineer of each city.

Would you assist in this defence effort by making available your Smoke Abatement Bureau for any consultations required and for such local help that you are in a position to give when problems arise? Your co-operation will be greatly appreciated.

☆ ☆ ☆

The following extract from a broadcast address in the U.S.A. will also be of considerable interest. It is by Dr. Sumner B. Ely, Superintendent of the Bureau of Smoke Prevention, Pittsburgh, Pa.

At a time like this, when we are all war-minded, the question which the average citizen asks is: "What relation has smoke abatement to defence?"

It is therefore most important that every citizen should appreciate that smoke is as closely related to defence as coal itself. The government needs coal, not only for work connected with the army and navy, but for all sorts of purposes as well; and the whole country is engaged in defence manufacture, so any shortage of coal would be extremely serious—really vital, as we know when there is talk of a coal strike.

Now we all know that smoke means waste and when we stop a badly smoking chimney a saving should result. Our smoke inspectors are highly specialised experts. They must be able to go into a plant and tell what is the matter with the furnace combustion; furthermore they must demonstrate to the fireman and owner that they know what they are talking about . . .

☆ ☆ ☆

The peculiar circumstances prevailing in this country, where for security reasons the production of smoke is encouraged, make it unlikely that a letter similar to that of the Bureau of Mines could be sent out by the Ministry of Fuel and Power; or that a similar broadcast could be heard on the B.B.C. We have observed considerable reticence in referring to the extraordinary situation, which we know has caused much concern, by which manufacturers are being simultaneously urged to produce smoke by improper combustion and at the same time to save fuel by correct combustion, and for the present we do not propose to say more on the subject. We can say, however, that the Society has not neglected its duties in the matter, and that we are looking forward to making a full statement when the time is opportune.

☆ ☆ ☆

Although the smoke abatement sections of the Public Health Acts are in temporary abeyance, we now have what in normal circumstances might be a far more effective way of preventing smoke. This is the Waste of Fuel Order, 1942, the object of which is "to prohibit the waste and uneconomical use and consumption of coal, gas, electricity, paraffin and liquid fuel." The term "waste of fuel" includes "its use in unnecessary quantity for a particular purpose," while "uneconomical use" means, for example, "the failure to take reasonable steps, including the provision of proper fittings and appliances to secure a reduction of consumption, and the failure to maintain such fittings in serviceable condition." It is curiously ironical that this Order (if enforced) cannot do other than directly and substantially promote smoke prevention in industry at a time when the production of smoke is also being encouraged. The paradox is perfect; but happily the responsibility of reconciling the irreconcilable is not ours.

* * *

It is fortunate for the continued existence of a smoke prevention movement in this country that attention must be given to the problems of to-morrow, and it is invigorating to turn to them from the bewilderments of to-day. We wish to draw the attention of every reader to the most important article by Dr. G. E. Foxwell that appears in this issue. Dr. Foxwell, who is a leading authority on fuel and carbonisation questions, supplements the Society's Reconstruction memorandum in one of its most vital aspects, and answers the question that was then implied: can sufficient smokeless fuel be made available to make practicable the complete smokelessness of all post-war housing? Dr. Foxwell's conclusion is that the answer is *yes*, provided that the Government and industry will plan ahead.

* * *

Given a lead by the Government we are certain that industry will eagerly plan ahead. The real problem is whether the Government will give this lead and declare, before it is too late, that post-war housing is to be smokeless and that the industries concerned will be aided and encouraged to make the plans required to fulfil this policy. It is a leading question, to which we draw the attention of the Ministry of Works and Buildings, the Ministry of Fuel and Power, the Ministry of Health, and Sir William Jowitt's department. A negative answer, or what is the same thing, no answer at all, means that the conclusions of the 1921 Departmental Committee on Smoke and Noxious Vapours Abatement are likely to remain as true in the future as they have been in the past: "But perhaps the chief factor in the failure to deal with the smoke evil has been the inaction of the Central Authority. No Government has, for many years, taken any action with the exception of appointing Committees, whose labours have had little or no result."

The Ministry of Health's new sub-committee on the Design of Dwellings has asked for, and we have been pleased to submit, a memorandum explaining in greater detail than before our proposals for smoke-free post-war houses. It is hoped to publish this in the Autumn issue.

* * *

There are numerous signs of increasing interest in the Society's work to integrate smoke prevention with reconstruction, and one of these is found in the increasing opportunity, despite difficulties, for lectures, which after a completely blank two years, are beginning to be asked for again. Mr. Charles Gandy, Chairman of the Executive Committee, recently gave an address at the CEMA "Living in Cities" exhibition in Liverpool and on July 23rd the Secretary gave a paper to the London and Home Counties Branch of the Incorporated Association of Architects and Surveyors on smoke prevention in post-war building. Another lecture was to the Lincoln Engineering Society which, it was stated, produced the best and longest discussion of the session. Alderman J. A. Webb, Chairman of the Salford Health Committee, at a meeting of the Royal Sanitary Institute in Salford, spoke on post-war public health problems, and dealt with smoke prevention, citing as an example of what might be done the striking progress made in St. Louis, U.S.A. Gratifying interest has been found in smaller meetings, even in rural districts.

* * *

At one such meeting, to a branch of the Women's Institutes, the discussion was opened by a lady who told of a Polish officer she had had as a guest at her home. Asked what had struck him most about England, his reply was: "The enormous amount of coal you burn in your houses and how cold they are!"

* * *

Mr. Gandy, at the Liverpool meeting, contrasted Roosevelt's "Four Freedoms" in politics with four natural freedoms we had also to win, which he described as the freedom to light clear and unsullied; freedom to air fresh and unpolluted; freedom to clean and healthy surroundings; and freedom to beauty in nature and the arts. These, he suggested, were a natural birthright of all living beings, in contrast with the four political freedoms which follow centuries of struggle and vigilance.

* * *

The interesting letter from Mr. Law, printed on another page, on the subject discussed in an article in the last issue for a new title for the Society, strikes a very promising note with the idea of a portmanteau name of the kind that has been very useful to such bodies, now so familiar, as ENSA, CEMA, PEP, and the older Scapa Society. But, if he will allow us to be critical, his particular suggestion, NAPAP, seems to suffer from the drawbacks of an inherent awkwardness and an uncertain pronunciation, though the full title from which it is derived may be thought ideal. Another member writes to suggest something on the lines of "The Society to Encourage Pure Air." This is a useful contribution to the discussion, and on the lines of Mr. Law's portmanteau suggestion, would give a simple and not undignified SEPA. Or, even shorter, why not "The Society for Pure Air," which would give SPA? And SPA, though literally a town with a mineral spring, to-day suggests health and amenity—a place where it is pleasant to live—which are the very objectives before us. The association of ideas induced by such a shortened title would not be without value.

* * *

Since the editorial on the Ministry of Fuel and Power was written the Society has been represented at a luncheon of the Institute of Fuel, as one of the national organisations concerned with the production or use of fuel, to welcome the new Minister, Major Gwilym Lloyd George. Major Lloyd George in his speech showed that the Ministry will be fully alive to the problems that lie beyond its immediate war-time tasks, and gave us reason to believe that a National Fuel Policy will be brought into being. The new Minister, indeed, showed that he had a farseeing understanding of his great responsibilities and opportunities. We should like to express the hope that he will similarly come to appreciate the need for integrating a plan for smoke prevention with this policy.

* * *

Coke and Smokeless Fuel Age in an editorial makes the same plea. "The National Smoke Abatement Society," it says, "has existed for many years to arouse public opinion to the dangers of smoke in our atmosphere. To some extent the Society has succeeded for there can be few people who do not now recognise that smoke is deleterious. Inevitably, however, these efforts came up against the bar of public indifference. If there is no compulsion there is no urge to change existing practice. A famous statesman of a past generation was wont to say: "If it is not necessary to change, it is necessary not to change." This inertia has prevented the precepts of smoke abolition being put into practice. The production of smoke wastes fuel in enormous quantities every year. There is not one word to be said in favour of permitting smoke-producing fuels or appliances to continue in domestic or industrial use . . . We look to the Ministry of Fuel to sponsor a smoke abatement campaign as soon as the war is over."

* * *

The Defence Bond Fund still remains open, and once again we appeal for contributions that will help the Society to build up the reserves it will need for its critical post-war campaign. The Fund is of course on war work until then. The main item in the fourth list of contributions below is not new money, but a transfer from the Lloyd's Bank account of the former Coal Smoke Abatement Society, which has remained open since the amalgamation of the two bodies. Many members will regret that the list should be so short, but they can help to give the next list a more impressive length.

	£	s.	d.
Previously acknowledged	331	6	6
C.S.A.S. Account	50	0	0
Dr. H. A. Des Voeux (2nd contribution)	5	0	0
J. H. Wicksteed	2	10	0
Widnes Corporation	1	1	0
Wembley Corporation	1	1	0
Glasgow Women Citizens' Association		10	6
Total (to July 20th, 1942)	£391	9	0

Just 100 Years ago Parliament ended one of the worst evils of the First Coal Age

BLACK DEATH

By Philip England

THIS year sees the centenary of the abolishing of a practice, grim and revolting though it was, which was peculiar to these islands. On July 1st, 1842, the statute of 1840, abolishing child chimney-sweeps, came into operation, thus ending one of the most cruel forms of child labour which so sullied the history of the early 19th century. Readers of " Oliver Twist " will already be familiar with this peculiar form of child exploitation but it would be unfortunate to let this centenary pass without a few comments.

While man must clog up his chimney by burning smoky fuel, their cleaning will always be a problem. Up to the 18th century the problem was not acute owing to the fact that very little of the smoke went up the chimneys! Most of it escaped through the doors or through the windows. Then our forefathers became more comfort loving, and, developing a dislike for draughts they concentrated more on getting the smoke up the chimneys, and to achieve this object, builders evolved complicated systems of flues and passages. As this occurred the question of cleaning this maze of sooty channels became a problem indeed. And then someone discovered a solution and found that small boys could wriggle up the chimneys and dislodge the accumulated soot.

The children for this task were obtained from various sources. Naturally, parents were unwilling to let their children be apprenticed to the chimney-sweeps, for apprenticeship meant that they would have to climb chimneys. The children were generally either parish or pauper children, unwanted, and the parish authorities were glad to dispose of them in any way. Then there were cases known of children being kidnapped by the sweeps and often poor parents sold their children. Smallness was the criterion for a successful child chimney-sweep and they usually started work at four or five years of age. They left their task only when they had outgrown the chimneys. They entered the chimney from the grate and the aperture varied from 12 x 15 inches to 7 x 7 inches (Hammond, *The Town Labourer*). It would seem incredible that a child could enter and sweep a chimney seven inches square.

When the children started on their business it can be imagined the suffering they underwent. Mental fear of the dark unknown of the chimney had to

H. Grey Bennet, M.P.
Leader of the demand for prohibiting the child chimney sweep.

be overcome by physical fear of the master chimney-sweep. Various threats were used by their masters to get the children to enter the chimneys. Sometimes the children would enter the chimney and would not proceed any further. Then the usual practice was to light a fire down below to drive the little sufferer up the chimney. When he reached the top he then had to work his way down and dislodge the accumulated soot as he did so. If there were any flues or horizontal passages they had to crawl along these and then crawl back pushing the soot into the main channel. It was in these flues that the children faced the greatest danger of death by suffocation. There were no footholds as such in the chimneys and they had to use their elbows and knees to grip the sides and help in the ascent and descent. Thus there was constant irritation of these extremities resulting in the formation of hard skin and tumorous growths. The rate of mortality in this grim trade was high and the general cause of death was suffocation in one of the side channels. Often too they were burnt to death as they were sometimes sent up to extinguish a chimney which was on fire.

The children were seldom washed and their living conditions were as disgusting as the trade they plied. Their bodies became malformed by constant twisting in the narrow chimneys and if they survived they reached maturity stunted physically and mentally.

Attempts at Reform

This state of affairs eventually led various benevolently inclined people to try to effect some sort of reformation. The first attempt was made in 1788 when an Act was passed regulating the employment of children as chimney-sweeps apprentices. The prime mover in this small attempt at reformation was one Porter, himself a msster chimney-sweep. . . However, this Act had little effect in practice and the abuses continued as before. In 1804 further reforms were attempted but met with but little success. A Society was then formed whose object it was to secure the abolition of child chimney-sweeps and to further this object this Society made offers for the best machine which would sweep chimneys and thus render the use of children unnecessary. Various machines were evolved which were able to do all that the child-sweeps had done hitherto. The introduction of these machines

Another contemporary print of a child chimney sweep.

met with violent resistance from the master chimney-sweeps who feared the loss of their trade.

In 1817, 1818, and 1819 further bills were introduced to secure the abolishing of child chimney-sweeps. The member who worked to introduce these bills was H. Grey Bennet, who was M.P. for Shrewsbury. All his attempts were frustrated by an indifferent House, but he continued to work with undaunted courage to bring to an end the misery of these child-labourers. Opposition to Bennet came from many quarters. Various influential people seemed to have shut their eyes to the grim sufferings of the children who swept the chimneys of their houses. Determined resistance came too from the master chimney-sweeps to the passing of any reforms.

Then in 1834 Grey Bennet succeeded in getting an Act passed which prohibited boys under 10 from climbing chimneys and all apprentices were to be allowed a trial period after which they could leave if they so desired. In 1836 Grey Bennet died but others were left to carry on the work which he had started and in 1840 the Bill was passed which prohibited boys or girls from climbing chimneys and on July 1st 1842, this Bill became law. Thus ended one of the most cruel forms of child labour, which caused untold suffering to hundreds of children in this period and which ended in the death of many.

With this centenary let us hope that soon the day will come when it will be unnecessary for us to have to clean our chimneys at all and that indeed will be an anniversary not lightly to be remembered by mankind.

The Reconstruction Memorandum

Encouraging Reception

THE Society's Memorandum on "Smoke Prevention in Relation to Initial Post-War Reconstruction" has had a most encouraging reception. The original issues of both this and the complementary pamphlet "No Clean City" have been completely exhausted, but it has fortunately been possible to have small second editions printed.

Press reviews and notices have been gratifyingly more numerous and often of greater length than had been thought likely at a time when space is so restricted.

One or two quotations from these reviews may be given. First must be recorded the emphatic and valuable support of *The Manchester Guardian*, which in a leading article showed full understanding of the total implications of the consequences of the smoke evil:

"**The arguments for smoke abatement have even more force in war than they had in peace. Loss of working time in industry through illnesses aggravated by smoke might conceivably mean the difference between a victory and a defeat in Russia or Burma. Smoke poisons the land on which we grow essential foods. The amount of shipping space which we could have saved in this war if we had really tackled smoke abatement in peace-time must run into millions of tons. Smoke is a fifth column which we should have destroyed long ago. . . .**"

The Medical Officer, another organ which always approaches the smoke problem in a wise and forward-looking fashion, gave almost a whole page to discussing the problem and the Society's proposals, and from this we may extract one passage:

"What Mumford has called the 'paleotechnic town' soon became a literal blot on the landscape, and the dire effects of its smoky pall spread far beyond the actual boundaries of the city. The remedy for these evils has been know for quite a long time, and it is unthinkable that the builder, the industrialist, the stoker and the careless householder should be allowed in the future to carry on an unconscious alliance against progress and common sense.

" As has been said above, the remedy for these bad conditions is known. It is the application of the remedy which has too often proved to be a pill which is either too bitter to swallow, or which has seemed to be so small as to be scarcely worth the consideration of the unfortunate town dweller. The patient will have to be warned that he is really ill, and convinced that in the interests of the community, no less than of himself, he will have to adopt the measures which are most conducive to his future welfare. A little coercion, an increase of knowledge, and abundant goodwill on the part of the inhabitants are necessary. The aims of the National Smoke Abatement Society are well known, and the progress which it has been able to effect since its formation in 1929 is a matter for satisfaction to those who know the difficulties. . . ."

The memorandum has been submitted to the Ministers concerned with reconstruction and is, we believe, receiving due attention in several departments and by committees investigating the different aspects of the post-war problem. Supplementary evidence and a more detailed survey of the domestic aspects of the case have been requested and have been submitted to two of these bodies.

The memorandum has also been sent to each of the local authorities affiliated to the Society, with the request that it should be considered and that, if possible, should be supported by a suitable resolution.

Up to the time of writing such resolutions of support for the proposals made have been adopted by the following authorities :

Bethnal Green, Brighton, Cardiff, Dunbarton C.C., Ealing, Easington R.D., Edmonton, Gateshead, Hereford, Hull, Luton, Motherwell and Wishaw, Poplar, Rutherglen, Sunderland, Sutton and Cheam, Uxbridge, Wembley.

In addition, the following, though not wishing to commit themselves to the specific proposals put forward in the memorandum, passed resolutions urging their full consideration by the Government :

Chester, Cleckeaton, Hammersmith, Shoreditch, West Ham.

It is hoped that further information about such resolutions will be received in due course from other authorities, and that similar examination of the proposals may be made by the principal non-affiliated authorities, to which the memorandum is also being sent.

A number of new members have joined the Society as a result of reading about and then asking for copies of the two booklets, and in these and other ways can be seen a growing interest in smoke prevention and reconstruction. In official circles, too, there is a more decided feeling of sympathy towards smoke prevention than has been found in the past. It still remains to be seen, of course, how much of this will be translated in due course into useful action.

A great deal more can be done to bring our views and proposals to the notice of the many persons and bodies who are interested, or who are potentially interested, in the subject. At the moment we have a fair supply of the two publications on hand, and we shall be glad to let any reader have further copies, or to receive suggestions for useful distribution.

Though some aspects of the Society's work have been halted by the war the present is possibly the most critical moment there will be for the future of smoke prevention. We appeal for the maximum active support of every member in helping to ensure that the opportunity is not lost.

CHANGE OF ADDRESS

Please note that the Society's address has been changed from Woodborough, Nottingham, to

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Who's Who in Smoke Abatement

Marion Fitzgerald

IN 1918, Miss Marion Fitzgerald went to Manchester to become private secretary to Councillor (now Sir) Ernest Simon. She had public health qualifications, was conversant with its law and practice, and had worked in the dual capacity of sanitary inspector and health visitor in Derby and London. One of the chief purposes of her new post was to assist Councillor Simon in work for smoke abatement.

Miss Fitzgerald took part in the growing activities of the Smoke Abatement League of Great Britain, which had its headquarters in Manchester, and became a member of its committee. When the League was merged into the National Smoke Abatement Society she became a member of the new committee, and is one of the few, and the only woman, to have served in this way throughout the whole of the fruitful period between the two wars. Since 1937, too, she has been one of the two joint secretaries of the Society's North-Western Branch.

She helped to write "The Black Smoke Tax," that valuable and often quoted report of the Manchester City Council's Air Pollution Advisory Board, and in 1922, jointly with Councillor Simon, wrote and published an excellent short text-book, "The Smokeless City." Later, she and Mr. C. Elliott, then honorary secretary, edited for the League a practical handbook on "Home Fires Without Smoke."

But smoke abatement is not Miss Fitgerald's only work of social value. She is an authority on housing, and in this field has carried out many investigations and researches, which have been followed by characteristically direct and observant reports. She says that in many respects housing and smoke abatement work are complementary to each other, and as one who has worked on the job when ways and means for smokelessness were difficult, she rejoices in the growing availability of good smokeless fuels and in the success of new kinds of grate.

She likes to work also on the research side of the smoke problem, and is indeed particularly well-equipped for this. Not only has she a wide knowledge of practical problems and of people, but combines a clear and logical mind with patience and understanding and that most desirable of attributes for such work—a sense of humour well blended with a sense of proportion.

Research and inquiry, she believes, is a necessary preliminary to propaganda, and, as many readers will recall, she was engaged, when war broke out, on a special investigation, on a national basis, into the economic losses sustained by trading concerns through atmospheric pollution. This work, of course, had to be suspended when the war started, and only an interim report was prepared. This was summarised in *Smokeless Air* (see Winter, 1939, and Spring, 1940 issues) and, valuable in itself, showed how promising this line of inquiry was for the establishment of facts of great importance to our work. And in Miss Fitzgerald's capable hands an inquiry of promise is something like a certainty.

THE PROVISION OF SMOKELESS FUELS

By G. E. FOXWELL, D.Sc., F.Inst.P., F.Inst.F., M.Inst. Gas E.

THE memorandum submitted by the National Smoke Abatement Society to the Government on the subject of smoke prevention in relation to post-war reconstruction sets forth facts and suggestions with which there can be no disagreement. It is notorious that democratic governments are susceptible only to pressure. They follow public opinion rather than lead it. If the medical profession and the local authorities who have for so long been in agreement with the objectives of the Society will exert that pressure and demonstrate unmistakably that the desire and necessity for smoke abolition exists, some major good may come out of the evils of our times.

The National Smoke Abatement Society has the single objective of smoke abolition. Every method of heating which will reduce or obviate the production of smoke is thus of equal value from the Society's viewpoint. It is necessary, however, to take a wider angle than this and to consider the whole subject as a branch of fuel technology. Now that a Ministry of Fuel has been set up, the wider view can be taken officially. The views of the coal, electricity, gas and oil interests are not at all convergent as to (*a*) the necessity for smoke abolition, and (*b*) the means to be adopted for bringing it about.

The Society, in its memorandum expresses doubts as to the availability of sufficient supplies of smokeless fuels. It points out that in general the emission of industrial smoke is unnecessary though in certain districts the problem will have to be examined in the light of technical considerations. The major problem is undoubtedly in the sphere of domestic and commercial heating. It is pointed out in Item 35 of the memorandum that the major problem of domestic smoke prevention is the open fire and range using bituminous coal. " For the future the construction of houses depending entirely on gas and electricity may be encouraged, but in general it will be necessary to provide appliances, including at least one open fire, for the burning of solid fuel. Such appliances and fires should, however, be designed for and use solid smokeless fuel." In Item 12 on the other hand, it is suggested that for commercial premises open fires should not be retained since " it is clearly preferable that the available open grate smokeless fuels and appropriate grates should be used for domestic purposes, particularly as, for a long time, there are likely to be inadequate supplies."

It is in the light of this doubt that the writer has been asked to discuss the availability of smokeless fuels for the programme of post-war reconstruction.

Coal Conservation

The subject must be considered, as has already been pointed out, from the wider aspect of fuel technology. This is primarily a matter of coal conservation. The attitude of the coal industry in the years between the two wars, a quite natural attitude from the purely sectional interest angle, was that the principal factor in coal utilisation was to get the maximum output from the mines. We are now beginning to realise that our major objective in coal utilisation must be to preserve our chief raw material so as to prolong the industrial activity of the nation as long as possible and until some other sources of heat and carbon can be obtained as a result of scientific research. Although our coal supplies are estimated to last for some 600 to 800 years the cost of mining is becoming progressively greater. Either we must accept greatly increased costs or we must leave unworked large reserves of good coal. The late Mr. Forster Brown, in his Presidential address to the Institution of Mining Engineers in 1940, pointed out that " the result is, at any rate in this country, that in the majority of cases many millions of tons are left unworked in collieries which have been closed down and abandoned owing to its having been found economically impractical to continue working them." It is, therefore, clear that the practical quantity of coal available in this country is nothing like so much as the theoretical estimates that have been made in the past ; and further that considering that we are now working the best and cheapest seams, we may expect very much higher costs of coal production and possibly poorer qualities of coal within the lifetime of this or the next generation.

By comparison other countries are not in so desperate a plight. Mr. Forster Brown examined this problem in the light of the history of collieries upon which he had made personal reports, and which produced a quarter of the total annual output of Great Britain. This analysis of his records revealed that " if the total tons of coal, estimated as probably workable at all the collieries, is divided by the total annual rates of output at the time each colliery was examined, the average life of all the collieries is seventy-five years. If, however, the total of the annual outputs is divided into the estimated coal reserves only in the seams being worked at the times of the examinations referred to, the average life of all the collieries of these seams is no more than forty-five years." In Germany, on the contrary, the average life at the total of the current rates of output was found to be 185 years. It is thus concluded that the life of the more cheaply worked and better quality seams being worked at the present time is relatively short, and that as these become exhausted and coal has to be worked at greater depths and under greater natural difficulties, the coal output and export from this country will decline still further relatively to competing coal producing industries.

The problem of smoke abatement therefore, in the writer's submission, must be tackled by the provision of such smokeless fuels as will conserve coal generally, and in particular will conserve the qualities of coal that are likely to be the earliest in short supply.

This conclusion must lead to a delimitation of the purposes to be served by the several available fuels. Oil fuel obtained by importation from overseas may be cut out because we can no longer afford to import oil for non-essential purposes. A consequence of this war is that it has caused us to expend in armaments the investments and other means whereby we obtained sufficient income to make up for the excess of imports over exports. Whereas in 1913 we exported coal to the value of £50,700,000 and imported petroleum products to the value of £10,800,000, in 1938 we imported petroleum products to the value of £43,300,000 and exported coal to the value of £39,000,000. Thus a favourable trade balance in fuels of £40,000,000 had been converted into an unfavourable balance of £4,000,000 before the outbreak of war. It thus appears to be unlikely that we can look to imported oil to provide smokeless fuel to any extent.

Gas and electricity both provide smokeless forms of heat, though these, under present conditions, are essentially complementary to the major requirements which can best be served by the use of solid fuels. It has been suggested, too, that in the best interests of coal conservation the sphere of development for electricity is for power and lighting rather than for heating, though this is perhaps a subject outside the purposes of the Society.

Smokeless Solid Fuel

It is therefore likely that for smokeless domestic and commercial heating we must look to the carbonising industries and to the use of naturally smokeless coals for the fuels that will be required for post-war construction. This view could be modified as regards commercial heating where buildings are centrally heated because, although coke used in gravity feed boilers may be the ideal for this purpose, it is possible to burn coal smokelessly on the scale required for centrally heating large blocks of offices and flats. If there is likely to be any shortage of smokeless fuels from the carbonisation of coal, therefore, it should be possible to heat large buildings whether commercial or flats, by raw coal.

A certain proportion of large buildings is already equipped for being heated by coke and no doubt in the normal course of commercial competition coal and coke will continue to share the market for heating large buildings. The essential problem, therefore, is that of providing the necessary heat for replacing raw coal for domestic purposes; this may be derived from coal carbonisation, the fuels available being coke and gas. The National Smoke Abatement Society's memorandum claims that one solid fuel fire must be provided in each house. This is not necessarily correct. Certain gas companies have experimented with the all-gas house and it has been established that even in the proximity of the coal fields if gas could be supplied at an all-in cost of some 4d. to 5d. a therm it is possible to perform all the heating and cooking necessary in a house by gas at no higher cost and often at lower cost, than with raw coal. The writer's personal experience is that the solid fuel open fire is very much a matter of custom and that once a solid fuel fire has been displaced by a gas fire the comfort derived from the gas fire is soon recognised to be no less than that derived from the coal fire, and the very much less labour in the house makes the ladies vote emphatically for the gas fire. The ideal from the point of view of cost, convenience and labour saving would appear to be the provision of gas for cooking and gas fires in all living rooms and bedrooms, with a coke boiler in the kitchen which will provide constant hot water, will act as an incinerator and will warm the kitchen. This system is already well-established in the South of England; it should not require very much effort to extend it to other parts of the country.

The National Smoke Abatement Society would aid in the attainment of its objectives if it briefed an architect with an established reputation to design a house for the economical use of fuel in this way instead of as at present designing the house from an architectural aspect and leaving the fuel appliances to be put into odd corners wherever there may be room for them.

It is probably a fair estimate to suggest that the gas companies in Great Britain between them supply some 1,200 million therms of gas (including coke oven gas) to the domestic consumer annually. In addition, it is probable that about 6,000,000 tons of gas coke reaches the domestic consumer. The coke ovens add perhaps 2,000,000 tons to this. Many years ago an estimate was made of 40 million tons of coal burnt in open fires and for cooking; but the inroads of smokeless fuels and electricity have now reduced it and the immediately pre-war figure may be taken as 33 million tons. The problem, therefore, is how to supply smokeless fuel to replace 33 million tons of raw coal.

A small proportion of the coal used is natural smokeless Welsh coal; but while these fuels can make a very useful contribution towards the objective, the bulk of some 30 million tons would still have to be replaced by the product derived from carbonisation. Following (but with a certain independence of view!) the excellent survey made by the P.E.P. in 1938-39 ("Report on the Gas Industry in Great Britain"), a table of heating values may be drawn up:—

Table I—Fuel used for domestic purposes annually.

	Weight (Millions of tons)	*Therms (Millions)*	*Average Efficiency in domestic use. Per cent.*	*Useful therms used (Millions)*
Coal ..	30	9,000	15	1,350
Smokeless coals ..	3	1,000	50*	500
Gas ..	—	1,200	50	600
Coke ..	8	2,240	35*	780
		13,440		3,230

* Includes closed stoves and higher volatile coals and coke in the open fire at lower efficiency.

Of the total of 3,230 million useful therms required for complete elimination of bituminous coal from the domestic sphere, the last three items totalling 1,880 million therms are already available.

For the provision of the remainder, special attention may be directed to item 48 of the Society's memorandum: "It must, however, be emphasised that the present difficulties would be largely overcome by an early and definite announcement on behalf of the Government with respect to the methods of heating to be used in post-war housing. The knowledge that this would entail a considerable and increasing demand for solid smokeless fuel would make possible the planning necessary for the production of suitable fuels in adequate quantity."

Coke ovens can carbonise at maximum practicable capacity some 20 million tons of coal a year, producing about 13 million tons of saleable coke. Between 5 and 9 million tons of coke is required by the iron and steel industry according to the state of trade. Part of the remaining oven coke is exported (say 1.5 million tons) and part goes for other industrial uses. Some 2 million tons probably reaches the domestic grate. If the market were available and in a normal state of trade the coke ovens could supply as an estimated figure another 1 million tons of coke a year, or, say, 100 million useful therms.

A great deal of rebuilding will be necessary at the coke ovens after the war. If the market for gas were assured, these ovens could be built on the combination principle and heated by producer gas. Clean coal could be produced for coke manufacture and the higher ash intermediate product of the washeries could be carbonised in special ovens to provide coke for the producers. In this way from 20 million tons of coal, some 1,400 million therms of gas could be liberated for external use. Allowing 600 million therms for use in the steel works, at least 800 million therms gross, providing 400 million therms of useful heat, could be obtained annually, making a total of 500 million therms towards the required 1,350 million therms.

To take advantage of this coke oven gas would require the building of regional gas grids. The linking up of gas undertakings on regional lines is already being actively discussed in the gas industry. This problem is not insoluble, therefore.

War-time experience has shown that the gas industry has more surplus capacity than it believed possible. Very considerable increases in gas and coke output have been obtained without additional plant. Putting this at its lowest, the gas industry could readily be expected to obtain an all-round additional output of 10 per cent. on existing plant. On 1938 output, this would account for 160 million therms of gas and 280 million therms of coke; on the preceding efficiency basis this would yield (80 + 100 =) 180 million useful therms.

Dr. G. E. Foxwell

It is thus estimated that we have from virtually existing carbonising capacity:

Table II

	Useful therms	
	(Millions)	*(Millions)*
Useful therms required		1,350
Additional coke from ovens	100	
Additional gas from ovens	400	
Additional gas from gas works	80	
Additional coke from gas works	100	
Useful therms produced		680
Additional carbonising capacity required		670

From this estimate it would appear that by planning ahead to make the maximum use of existing sources of heat, sufficient heat could be secured to supply the new post-war construction by the time it was built. Districts remote from the coal fields would require additional carbonising and purification plant, but the power to do this is well within the capacity of the gas and coke oven constructional companies. From the carbonisation of 1 ton of coal in gas works there is derived some 90 useful therms of combined gas and coke for sale. From coke ovens the amount would be somewhat greater. During the immediate pre-war period coke oven constructional firms were building at the rate of some 2,000,000 tons of carbonising capacity per year, or say, 200 million useful therms of gas and coke per year. If gasworks contractors were added to this—and bearing in mind that some coke oven builders have gone out of business in recent years—it would appear that there would be no difficulty in making up the additional 670 million useful therms required in three years.

The smoke abolition campaign can, therefore, be waged without fear of a shortage of fuel *provided that the Government and industry will plan ahead.*

Within the limits of space available, it has been impossible to discuss all aspects of this important subject. This, however, must be added. The national importance of coal conservation, an importance which is hardly recognised by the Government, demands that the best possible use should be made of existing facilities, and of the coal carbonised in existing plant. So far as possible new plant should be based on utilising the poorer coking coals. The erection of vertical retorts at collieries for this purpose instead of the conventional coke ovens should be encouraged. We want the best smokeless fuels for the purpose, and coke ovens are not necessarily the best plant in which to make them.

It is by no means certain that the coal industry could provide sufficient coal of coking or gas quality for a very great expansion of the carbonising industry. That is another reason for (*a*) utilising other coals for the purpose of manufacturing smokeless fuel, and (*b*) utilising existing sources of smokeless fuel such as coke oven gas to the maximum.

The Report of the Bengal Smoke Nuisances Commission for 1941 shows that when activities began in 1906 the average emission of black smoke per chimney was 13.1 minutes per hour. To-day it stands at 0.09 minutes. During the year action was taken in 4,141 cases. There were 41 prosecutions and 35 convictions.

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Correspondence

Pure Air and Roof Gardens

The Editor,
Smokeless Air.

Sir :

Thanks to the efforts of your Society, and the general movement of public opinion towards enlightenment, we now seem to be approaching the time when the air of this country will cease to be polluted by industrial and domestic smoke, and at the same time there is becoming manifest a strong desire that in the planning of post-war England every effort should be made to make our towns and cities more attractive places to live in.

One of the leading features of post-war town planning is bound to be the rescue and the reclamation of those dismal and almost derelict areas of mean streets which, in all our older cities, now intervene between the central business quarters and the recently constructed rings of suburban dwellings. Those intermediate areas are admirably situated from the standpoint of accessibility, and their development on modern lines will check the present inordinate flooding with bricks and mortar of further miles of the surrounding countryside, pushing the open country always further and further away and sterilising so much valuable agricultural land.

One hopes that the architectural designers of our new buildings of every kind will keep in the forefront of their minds the near advent of smokeless air, and will take full advantage of the precious contribution which such a condition can make to the amenities of urban life. It is the demon smoke that has wasted all our roof space and made the over-house prospect of the average town so vile. Buildings last for a century, but pure air will be with us in a few years, and there is every reason why we should be preparing for it now. It is already late ; it is sad to think of the hundreds of thousands of buildings which have been erected within the past twenty years with ugly, sloping, useless roofs which will persist far into the smokeless era. But if the roof of every building erected from now on is planned with a view to its use as a roof-garden we shall be in a fair way towards providing in England the charming vistas of clean buildings, flowers, and humanity at ease which we have all admired and envied in places where the grim hand of smoke has not been dominant. Chimneys, for the present, we must have, but there is no reason why they should not be designed with architectural grace, and even as things of " post-smoke " utility.

Yours faithfully,
T. F. P.

Welsh Coals

The Editor
Smokeless Air.

Sir :

I note in the article by Prof. E. G. R. Taylor on " Problems of Fog and Air Pollution " in the Winter-Spring issue of *Smokeless Air*, it is suggested that the cleanliness of the atmosphere in Cardiff may be due to the burning of Anthracite coal.

Comparatively little Anthracite is used in Cardiff, probably not more than that used in any town of a similar size in Great Britain. For domestic purposes, coal of 15% to 20% volatile such as is produced in the neighbouring coal-mining valleys is the most commonly used fuel. This type of fuel is of a semi-smokeless character and due to the development of high temperatures in the grate burns off the volatile content very effectively making the fuel really more smokeless than its volatile content would indicate.

For domestic usage other than open fires, namely, slow combustion stoves, central heating and so on, the lower volatile smokeless Welsh coals are used, these having a volatile content of 11% to 14-15%.

In commenting on the statement, I am prompted to do so as in very many instances there is an assumption that Welsh coal must necessarily be Anthracite or anthracitic and this mistaken view has a very definite repercussion on the expansion of our industrial and domestic market. You will no doubt remember the point being raised in the Press some time last year when it was stated that the dumps of Welsh coal could not be used for domestic purposes, a statement which was challenged and defintely disproved by South Wales. In the industrial field, the suggestion that Welsh coal could be utilised for steam-raising purposes on both large and small scale Plants is often met by the statement that such Plants cannot burn Anthracite, the fact that South Wales produces fuels ranging from Anthracite to gas coals being overlooked or not fully understood.

Yours faithfully,
E. K. REGAN
(F. Inst. Fuel)
Fuel Engineer, Powell Duffryn
Associated Collieries, Ltd.

[We hope to publish, in an early number, an article dealing with the part Welsh coals can play in the expanding use of smokeless fuels envisaged in the plans for smoke prevention in post-war building.—Ed.]

The End of Smoke Abatement?

The Editor,
Smokeless Air.
Sir:

I am writing to express my appreciation of the inspired article which you published in the last issue of *Smokeless Air*. It is imperative that when the period of reconstruction eventually becomes real and tangible, that every person in the country should be given a lead in the right direction, " that of demanding pure air to breathe and a clean place in which to live." For the past twenty-five years I have taken a whole-time active part in this movement and watched it gradually develop from a babe to a fairly healthy youth who, at the moment, requires an amount of stimulant if he is to be kept alive. Let us look back on those years and see where the movement has been weak or has failed, because undoubtedly, when it came to testing time in 1939, it was not sufficiently strong to stand up to a blow from people who were anxious for its demise.

Practical smoke abatement has been in operation in industrial areas for over 80 years, but the number of people carrying out the work in its entirety were very few, and the progress made was much too slow. In addition, the number of people who professed to br supporters of smoke abatement, or even the abolition of smoke, were not sincere in their desire to see practical applications of this work, in fact, they were " humbugs " who did more harm to the cause than if they were definitely hostile.

Some years ago I gave a paper dealing with " Smoke Abatement on a Regional Basis," and raised a storm of indignation because I had the temerity to state that the work was specialised engineering work, and should be carried out on those lines. I do honestly believe that had it been made an engineering problem originally, greater progress would have been made. Do not let us make the same mistake in the future, there is plenty of work to be done, a clean atmosphere to be maintained, and the right people must be entrusted with the work. It will be carried out on Regional lines in conjunction with schemes for Town and Country Planning, with " Complete Zoning " wherever possible.

What shall we call the Organisation or Society that will sponsor and supervise the work?

The National Smoke Abatement Society has done great work of a pioneer nature, with an uphill fight against lack of funds and strong vested interest prejudices. The author stated that the day of " Abatement " is now past. He is right, it passed many years ago; and discussions on " Air Pollution Prevention " have been taking place for the past ten years.

The new name must be comprehensive and it is not easy to find a short or simple one for that reason. Taking the four known letters of the existing Society as a basis " N.S.A.S." and substituting the letters " N.A.P.A.P." might offer a solution, and the new organisation called " NAPAP," with The National Association for the Prevention of Air Pollution as the complete title. It's a mouthful but there it is for objection or approval.

Yours faithfully,
JAMES LAW.

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SMOKELESS AIR

The Smoke Abatement Journal

Wartime Issue No. 12 **Autumn, 1942**
(Vol. XIII., No. 50)

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COMMENTARY

Fuel Consciousness

THE campaign for fuel economy is now in full swing and is one of the most important offensives of the war to be launched on the home front. It is being conducted with great ability and no little subtlety, and is driving deep salients into public indifference. For the first time, perhaps, the value of fuel is being fully appreciated by the whole of the British public, although, of course, to millions it has always been a commodity to be used as sparingly as possible. A real fuel sense is growing and with it must come a wider understanding of the nation's dependence upon coal and its derivatives. This is to the good from every point of view, and in the years after the war it may materially help the smoke prevention movement, which is simply one expression of the need to utilise our fuel resources with wisdom and foresight.

A great publicity campaign cannot avoid being provocative, and may indeed purposely seek to provoke. Some of the ways and means suggested for economy may arouse wrath or even derision, but even in doing so they are succeeding in their purpose. The argument and counter-argument being fanned to a blaze in every home may indeed create heat enough to bring about substantial savings of fuel. Rationing is either desired as the means for ensuring fair shares for all or is denounced as something really beyond the pale. If notes could be compared between the Ministries of Food and Fuel it would doubtless be found that we are even more concerned about our grates than about our gullets.

When such a furore can arise about temporary measures during a time of grave peril, it seems little wonder that smoke prevention, which implies permanent changes in normal times, should have made such relatively little progress. The wonder indeed is that it has gone as far as it has. But with the people conditioned to a new respect for King Coal we may henceforth find the road a little smoother.

The Smokeless Way

Incidentally, although conditions do not permit any drive for new domestic smoke abatement in support of the fuel economy campaign, it is to the national advantage to use smokeless methods, and those who are doing so have a credit mark over and above what they are effecting in the way of direct economy. The use of electricity and gas assists the difficult problems of transport and distribution, and the use of carbonised fuels means that coal derivatives essential to the war effort are not being lost. A high fuel authority recently told us that " it is not sufficiently realised that the use of smokeless fuels does have the effect of reducing the amount of coal that has to be mined." The utmost economy in the use of smokeless fuels must, of course, be attained, but now, as always, it is desirable to use them in preference to raw coal.

The Scott Report

The Report of Lord Justice Scott's Committee on " Land Utilisation in Rural Areas" is a fascinating and widely-ranging document. Air pollution is not generally looked upon as a rural problem, but we are glad to note that the existence of nuisances serious to the countryside is recognised by the Committee, which states (paragraph 93): " Another possible cause of harm to agricultural production comes from the noxious fumes and poisonous effluents discharged by certain types of factories. Instances have occurred where smoke or dust from factories or quarries has ruined agricultural crops for miles around, while in other instances effluents from such factories as milk or canning factories have made streams and rivers running through neighbouring farms unfit for watering the stock. Such factories have also frequently marred the beauty of surrounding country."

In discussing rural housing the Report deals with electricity and gas supply. It makes recommendations for reorganising, standardising, and developing electricity supply in rural areas. Speaking of the desirability of giving tenants the option of using either gas or electricity for cooking and heating, the Report continues : " The thermal efficiency achieved by the conversion of coal to gas and coke is such that not only should the use of coke stoves and fires be encouraged on that ground alone, but also as promoting a smoke-free atmosphere." The Report views with approbation the growing improvement of gas distribution and the development of local gas grids, and believes a considerable extension of gas supplies to villages is " possible, probable, and desirable."

The wise outlook with respect to air purity on the part of a committee concerned only with rural problems gives us reason to hope that the far more pressing problem of the urban air will in its turn receive proportionate attention.

Post-War Homes

The memorandum submitted by the Society to the Design of Dwellings Sub-Committee of the Central Housing Advisory Committee of the Ministry of Health will be found in full on a later page. Among other memoranda submitted, and which have been published, that from the National Council of Women supports our recommendations in declaring : " A polluted atmosphere is detrimental to health and comfort and adds substantially to household labour and expense. Every practical step should therefore be taken to ensure absence of smoke from all new homes."

Similarly, recommendations submitted by the Women's Gas Council include : " All heating should be exclusively by smokeless fuel. This is essential for the sake of health and national economy, and in order to provide the home with clean, labour-saving service."

Britain Rebuilt

A well-printed booklet under this

title by Eric S. de Maré is published for the Social Credit Party (by Sidgwick and Jackson Ltd., pp. 72 and illustrations; 2s. 6d. net). The author is an architect and his town-planning and architectural proposals are both stimulating and useful, though it would appear, as may be inevitable in such a publication, that their fulfilment is somehow dependent upon the panacea that it is the primary purpose of the book to promote. The prevention of smoke, we are glad to note, is demanded: " The smoke nuisance must be entirely eliminated from the new towns. This is not a minor consideration. The waste of time and energy in cleaning and in ill-health caused by fog is enormous. If we do not eliminate this nuisance, planning for sunlight and air with roof gardens and outdoor amenities becomes ridiculous." So far Mr. de Maré is on firm ground, but he continues rather less accurately by saying: " It can be eliminated by general electrification, by the limiting of coal fires and by the location of industry away from residential towns. All factory smoke can and should be washed before leaving the chimney stacks."

It can be eliminated only by eliminating, and not limiting, coal fires. Factory smoke can and should be prevented from being formed during combustion, and washing is to remove grit and acids and not smoke. The location of industry away from residential towns may be a good planning measure, but it is no alternative to the prevention of smoke. The effects of air pollution are not avoided by shifting its source from one spot to another—as the Scott Report (q.v. above) duly notes.

Rebuke

One of the Local Authorities to which our " Memorandum on Smoke Prevention in Relation to Post-War Reconstruction " was sent with the request that the proposals should be considered by the appropriate committee, informs us that this was received with satisfaction. Another declares it is prepared to support any action the Society may take. But another has passed the following crushing resolution:

That the National Smoke Abatement Society be informed that so long as it remains necessary for the best leaders and organisers to give their attention to the war effort, the Council would prefer that the consideration of post-war reconstruction problems of this nature be deferred until they are free to give such problems the consideration they deserve.

We forbear to make any comment beyond noting the fact that this same authority, before the war, declined to become a constituent member of the Greater London Advisory Council for Smoke Abatement on the ground that " no useful purpose would be served by the appointment of a representative." So *when*, we wonder, may the problem receive attention ?

Sequel

Dr. G. E. Foxwell's article in our last issue on " The Provision of Smokeless Fuel " for post-war reconstruction has created much attention, and we are glad to note that he was invited to read a paper on similar lines to a meeting of the Institute of Fuel on November 12th. It is hoped to give some account of the discussion in our next issue.

The paper read recently by the Society's secretary to a meeting of the Incorporated Association of Architects and Surveyors, at which the Chair was taken by Lord Horder, has been reprinted from the Association's journal, *Parthenon*. A small number of copies of this reprint remain on hand and will be sent to any readers who would like one.

Exhibitions

Some of the Society's exhibition material has recently been loaned to post-war planning exhibitions held in different parts of the country. This material is pre-war but it will fit in excellently with such exhibitions, and in the course of time it may be possible to prepare something new. Any readers who may be concerned with the exhibitions or displays that are doing so much to educate the public in the needs of the future are invited to inquire about the loan of exhibits, or other forms of co-operation, from the Society.

DESIGN & EQUIPMENT IN POST-WAR HOUSING

In Relation to Smoke Prevention

A Memorandum submitted at the invitation of, and to, the Design of Dwellings Sub-Committee of the Ministry of Health's Central Housing Advisory Committee by the National Smoke Abatement Society

The Prevention of Domestic Smoke

(1) This Memorandum may be prefaced by a brief explanation of the Society's views on the problem of domestic smoke. This class of smoke constitutes a considerable proportion (in London about two-thirds), of the total smoke emission. Further, being evolved at much lower temperatures than industrial smoke, it contains a larger proportion of the harmful tarry matter that gives the soot deposit its adhesive character.

(2) The smoke problem of our towns and cities cannot therefore be solved unless domestic smoke emission is stopped. Technically, there is nothing to prevent this being achieved within ten years or so following the war, but for that purpose the requisite changes and developments in fuel usage must be a deliberate part of our post-war social and industrial planning.

(3) This is desirable not only as a means of ending the smoke nuissance, but because of the growing demand for fuel economy and the conservation and proper use of fuel resources. A comprehensive and co-ordinated policy for their most effective utilisation must lead, with increasing urgency, to the cutting out of all fuel waste, including waste in the form of smoke. Design and equipment of both dwelling houses and industrial plant must therefore conform to the needs of a scientifically planned fuel utilisation policy. To equip new houses or new industrial plant with appliances technically already obsolete would, for reasons of national economy as well as of smoke prevention, be inexcusable.

(4) It is equally important, from the points of view of town-planning, health, and urban amenity, which are rightly receiving careful attention in the general scheme of post-war reconstruction, that a pure atmosphere be secured for our towns. (Reference may be made to the Society's booklet, " No Clean City "). The town-planner must be able to work in confidence that the necessary steps are being taken to ensure that fresh air, natural light, clean building surfaces, the free growth of trees and plants, shall within the period for which he is planning be the rule, not the exception, in the entire city area.

(5) The post-war housing programme will therefore either add to existing sources of smoke pollution or it will, as is hoped and urged by the Society, be planned for complete smokelessness.

Domestic Heating Standards

(6) The continuance until the present day of the smoke nuisance is part of the price we pay for the deplorably low standards of heating and of fuel utilisation that prevail in this country (and

which incidentally have become increasingly apparent during the present emergency situation). It is urged that in future housing much greater attention be given to the heating installations and that these be planned as an integral part of the structure of the house. The household economy that is exercised during the whole of the time a house is in occupation is largely based upon the arrangements for cooking, hot water supply, and space heating, and these should be given the maximum possible efficiency and convenience.

(7) If regarded as an installation demanding scientific thought and planning, and if capital cost is considered in relation to the economies in fuel consumption that may be attained, the standards of domestic heating could be very quickly and notably raised. The increased comforts and savings resulting from this would be of direct value to the householder and the final aggregate economy in fuel consumption would be of considerable national value.

(8) A similar opportunity for reform presented itself after the last war, and the Departmental Committee on Smoke and Noxious Vapours Abatement appointed by the Ministry of Health, stated in its Interim Report (1921) :—

> " In conclusion, we desire to emphasise the fact that the present housing situation affords a unique opportunity for constructive reform with regard to the heating, cooking and hot-water supply arrangements in domestic dwellings."

It is unfortunate that the opportunity referred to was not then taken, but the ways and means for constructive reform are to-day much superior and capable of being adopted far more readily than they were then. The Society is anxious that the second opportunity that now presents itself should not be similarly neglected.

Application of Proposals

(9) The proposals and discussion which follow have been written with the smaller or average type of house or flat in mind, because such houses will comprise the greater part of the building programme and will be erected by or under the control of public authorities. What restrictions are required to prevent smoke emission in small houses should, nevertheless, be required to be applied to all houses, irrespective of size and whether they are built under public schemes or by private enterprise. Whatever arrangements are practicable for the smaller houses will be equally practicable and possibly more efficient with the greater scope and less concern about cost that prevails in the building of larger houses. The completely smokeless home is not a Utopian ideal to be achieved only by effort or sacrifice. It is a logical and desirable aspect of the modern home already giving satisfaction in houses of all types.

(10) If the production of smokeless fuel is not developed as is required it may not be possible to ensure the complete smokelessness of all new houses as and when they are erected. In that event, we most strongly urge, however, that the principle of complete smokelessness be established in specific areas, such for example, as those in or adjacent to places of valuable natural amenity, or near to the central areas of cities (for the smokelessness of which proposals have been made by the Society). Rural housing, on the other hand, is of lesser importance with respect to smoke prevention.

Structural Factors

(11) Among the structural factors that help to promote fuel economy and add to convenience in fuel use, the following may be stressed :—

(*a*) Outer walls should embody the best practicable means for heat insulation.

(*b*) Chimneys should wherever possible be built into inside walls to utilise heat otherwise radiated into the open air.

(*c*) Attention should be given to the prevention of heat losses due to excessive draught. Doors, windows, and floor boards should be required to be well fitted.

(*d*) Attention should be given to the design of flues and the building and design of firebacks and openings, which should be in accordance with the principles indicated as a result of researches made by the British Coal Utilisation Research Association.

(*e*) Much greater attention should be given to the important, but frequently neglected, question of fuel storage. The space provided for this should in all cases be efficiently protected from the weather and should hold at least ½ ton of each of two types of solid fuel in separate compartments. It should be accessible under cover and where possible built on or close to the house itself. Further, in houses that permit such an improvement, there should be a means of access to the fuel from inside the house—i.e., by a hatchway adjacent to the boiler or principal fire.

(*f*) For reasons of fuel economy and to encourage a wider appreciation of a generous hot water supply, it is suggested that the insulation of hot water cylinders and the lagging of hot water pipes should be required as standard practice.

Cooking and Hot water Supply

(12) In the past the kitchen, or living-room-kitchen, of the smaller and medium-size houses has been equipped with a combination range carrying out the triple functions of space-heating, cooking, and hot water supply by means of a back-boiler. The old-style range had a remarkably low thermal efficiency. According to A. H. Barker (Tests on Ranges and Cooking Appliances, Fuel Research Board Special Report No. 4, 1922), " such a range, however used, may be taken to waste at least 85 per cent., and to supply to the food and hot water taken together not more, in the best case, than 15 per cent. of the heat in the fuel used, and usually about 11 per cent. as a maximum. Of this 11 per cent. a large proportion is wasted later by leakage, defective insulation and the like. It is probable that no more than 5 per cent. of the heat in the fuel is actually employed usefully except for warming the house."

(13) It is believed that such ranges were, up to the war, still being manufactured and installed in new houses, even if only to a limited extent, in the north of England.

(14) The Society strongly urges that the manufacture or installation of such ranges should be prohibited in all new housing.

(15) New types of combination range of higher efficiency, embodying a low set fire and undoubtedly cleaner and more convenient in use, have become popular, again mainly in the north and midlands. Such ranges have been adapted for the use of smokeless fuels, and from the purely smoke abatement viewpoint are when so used entirely satisfactory. On broader grounds, however, it appears to be preferable, as a rule, to equip new houses with a separate cooking appliance, and in point of fact it will be found that a large proportion of the occupiers of houses equipped with a combination range install in addition, a gas or electric cooker. This is clearly wasteful and the kitchen is rarely planned to include a further appliance in a convenient position.

(16) The installation of a domestic hot water boiler has become general practice in the south of England, and this permits a more satisfactory arrangement. It is the most economical way of obtaining hot water in substantial quantity, and except in the special case of the smallest types of house, or where district heating is employed, it is suggested that the standard equipment should be a domestic boiler and either an electric or a gas cooker (according to the preference of the occupier). The kitchen should be planned to hold these appliances in a suitable recess, with a flue for the boiler and a canopy and flue above the cooker to carry off steam and smells of cooking. Electric or gas water heaters may with advantage be installed in some cases, particularly in flats.

(17) The domestic boiler burns coke, anthracite, or semi-anthracitic coal, all of which are smokeless. Thus it is possible, and on all grounds desirable, for the first two household requirements, those of cooking and of hot-water supply, to be satisfied, effectively and economically, with complete smokelessness. The Society therefore urges that this should be ensured in all post-war urban or semi-urban housing.

Combined Kitchen-Living Rooms

(18) A special problem arises in the smaller type of house where the kitchen is used as the general living-room. A

domestic boiler will provide enough heat to warm a kitchen, but it does not give the traditionally cheerful appearance, even when the front is open, to which people have become accustomed from the open combination range or open fire. If, in such cases (and they are many) a boiler were placed in a scullery and the kitchen-cum-living room were equipped with an open fire, the desire or need for economy would lead to a frequent disuse of the boiler.

(19) It would be possible to install in the kitchen an open fire with a back-boiler, but a more satisfactory method may be found in a new design of domestic boiler, which could be closed or converted to an open fire. It is indeed understood that work is at present being conducted upon the design of such an appliance.

(20) If a satisfactory convertible boiler of the type mentioned be manufactured in quantity in time for the building programme, it is suggested that its use be required in all appropriate houses as an alternative to the ordinary domestic boiler. A supplementary electric or gas water heater could with great advantage be installed in the scullery or bathroom for use when there is no fire.

Space-Heating

(21) The major problem in the prevention of domestic smoke is that caused by the open fire burning bituminous coal. The open fire in the general living-room or kitchen (where this is used as a living-room) is in use for lengthy periods, probably far in excess of the time for all other fires in the house together, and it is the smoke from these fires which comprises the main part of domestic pollution. Unless there is reform here the greater part of the domestic smoke nuisance will continue unchecked. The problem would be solved by the abolition of the open fire, which in the course of time is likely to become obsolete on grounds of inefficiency and the unnecessary labour it required. The erection of houses without open fires may be encouraged, but for the present the majority of the population are accustomed to and desire open fires, and one should be provided in the main living room, but generally not elsewhere, of new houses.

(22) The open fire can be rendered smokeless by the use of solid smokeless fuels (process or natural) in place of the raw bituminous coal hitherto used. Some smokeless fuels will burn satisfactorily on any efficient type of grate suitable for coal, but harder fuels (i.e., most cokes and the natural Welsh smokeless coals) require the special types of open grate that will allow, when it is required, a greater draught. The essential features of these grates (which were being installed in large numbers prior to the war) are the wider spacing and arrangement of the firebars, means for the ignition of the fuel by gas, and superior methods of draught control.

(23) It is suggested that this type of grate should be required to be installed in all houses to be erected after the war. The grounds on which this proposition is made are as follows.

(24) The Society has already suggested, in its printed memorandum on "Smoke Prevention in Relation to Initial Post-War Reconstruction," that the maximum degree of smokelessness should be attained in post-war housing, and has there pointed out that the extent to which this will be possible will depend upon the quantity of suitable fuel that will be available at the time the houses come to be occupied. At present there is not sufficient suitable fuel available for the full potential demand, but, as was stated, "the present difficulties would be largely overcome by an early and definite announcement on behalf of the Government with respect to the methods to be used in post-war housing. The knowledge that this would entail a considerable and increasing demand for solid smokeless fuel would make possible the planning necessary for the production of suitable fuels in adequate quantity." It was therefore suggested that an authoritative Committee or Board be set up by the Government department or departments concerned to examine the subject in detail and to propose practical schemes, capable of being fully developed as the situation becomes more determinate, for establishing the ways and means for attaining smokelessness in all new housing. The smokeless fuels which would be produced as a result of this policy being adopted would largely be of a type that would require the special

type of open grate advocated. Other forms of smokeless fuel (e.g., low temperature carbonisation semi-coke) can also be used on these grates with perfect efficiency.

> (An article by Dr. G. E. Foxwell, a leading authority on carbonisation problems, appearing in the Summer, 1942, issue of the Society's journal, "Smokeless Air," discusses the increase of production that will be required and reaches the conclusion that sufficient smokeless fuels for all new housing requirements can be made available after the war provided that the Government and industry will plan ahead.)

(25) Even if this policy could not be carried out immediately on a scale to cope with all new houses, the special grates could, for the time being, burn coal just as effectively as would the ordinary type of grate. When in due course it was desired to introduce the use of smokeless fuel no replacement or alteration of the grates would be necessary.

(26) The special grates are likely to be available in improved forms after the war and are in any case probably the most efficient form of open fire available, whether for the use of coal or smokeless fuel.

(27) The fact that they are equipped with a permanent means for gas ignition also adds to their convenience, apart from the fuel used.

(28) A further development towards increasing the efficiency of the open fire may be available in quantity after the war, namely the "convector" type of fire, in which passages around the fire set up a flow of warm air into the room. It is stated that this type of fire will reduce fuel consumption up to 40 per cent. Such fires, in combination with the special grate and gas ignition, would give the most efficient form of open fire yet known, and it is urged that every effort be made to ensure their rapid development and full use in all post-war housing.

(29) The open fire, where it is installed, will be in the principal living-room. Other rooms may readily be heated by smokeless methods, including gas and electric fires and hot water radiators. In some cases it may be desirable to equip the house with built-in gas or electric fires, but generally the choice should be left to the occupier.

(30) One of the most important equipment details is that all houses should, when being built, be fully supplied with gas and electric points in each living room and bedroom. A gas point for the ignition of the domestic boiler and a "gas poker" should also be standard practice.

(31) The Society further urges a much wider use of central heating, not necessarily in place of, but supplementary to the open fire, and heating by electricity and gas. Central heating is still perhaps, looked upon with some disfavour by many, in spite of its undoubted economy and convenience. It is, however, not generally considered as a means for *primary* warmth which can be supplemented as required by radiant forms of heat. If such primary warmth were provided gas and electricity would also be used more widely, as the cost of bringing the room up to comfort temperature would be far less than when these mediums are used as the sole sources of heat.

(32) The domestic boiler should therefore be large enough to make possible the installation of a suitable number of small radiators, which should be used to supplement radiant heat in appropriate rooms. At least one bedroom should be so equipped to ensure a source of inexpensive warmth in case of illness, and a quiet room for study, e.g., for older children doing their home lessons.

Flats and District Heating

(33) The heating of flats, with respect to cooking, open fires, and gas or electric fires, is essentially the same as for individual houses. There are, however, greater opportunities for hot water supply from a central boiler house and for space heating by means of radiators. It is suggested that in all types of flats these possibilities be carefully examined and utilised as fully as possible.

(34) Similarly, the possibilities of central hot water supply, for blocks of individual houses, should be closely examined, and although in itself the

subject may be outside the terms of reference of the Design of Dwellings Sub-Committee, the important possibilities of this principle upon a still larger scale, in what is known as " District Heating " deserve very careful consideration. This is discussed in the Society's previous memorandum. It has already been used with success in some countries and it is not impossible that its widespread adoption in this country may lead to revolutionary results both in the heating equipment of the individual house and in the general layout of housing estates.

Summary

The prevention of domestic smoke is of first-rate importance in the solution of the smoke problem. It will assist the development of a fuel policy based on the need for the better utilisation of fuel and for coal conservation. Post-war housing will either add to the existing problem or it will begin a period leading eventually and ever rapidly to complete smokelessness. Our faith in that possibility will affect all our ideas in relation to housing and town planning.

Domestic heating standards are deplorably low and all measures to improve them should be welcomed. The heating equipment should be planned as an integral part of the structure of every dwelling.

Heat insulation, flues and fire backs and surrounds are matters needing careful attention. Importance is attached to fuel storage, provision for which should be adequate and convenient.

Cooking should generally be separate from hot water and space heating appliances, and should normally be by gas or electric cookers. The domestic boiler should be the standard appliance for hot water supply, except in smaller houses where only one fire is in use and the kitchen is used as a living room. Here a new design of domestic boiler would provide, when so desired, an open fire.

Provision should be made, as a rule, for one open fire, but the grate should be of the special type designed for the use of smokeless fuels. If the supply of smokeless fuels is inadequate at first, coal could in the meantime be used satisfactorily in such grates. The efficiency of the open fire can be further increased by the adoption of the convector design of fire, in combination with the special grate.

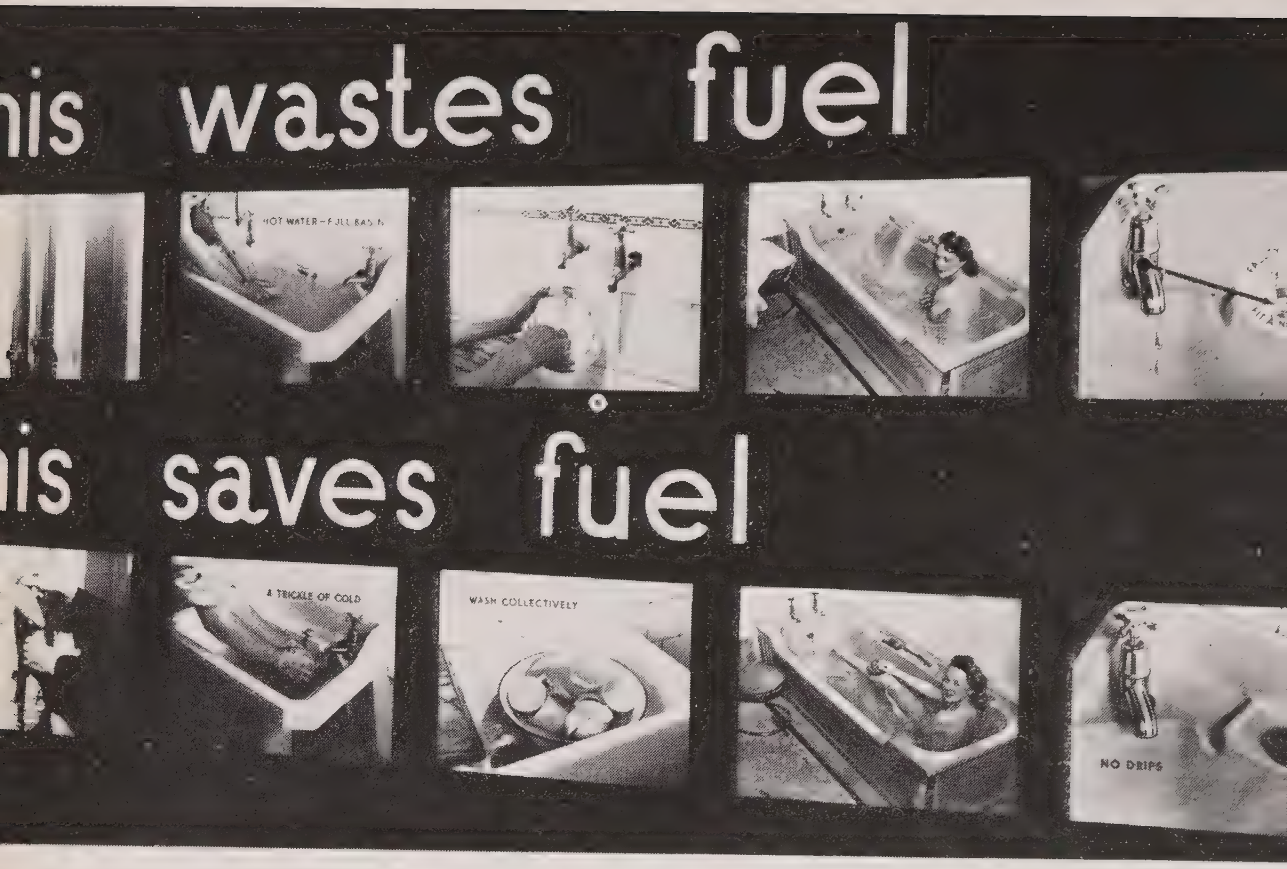
Other rooms should be equipped with gas and electric fires, or with points for the connection of such fires. Domestic boilers should be large enough to permit the installation of small radiators to give partial central heating for the supply of primary warmth to these rooms.

In flats hot water may be supplied from a central boiler plant, and attention is drawn to the important possibilities of district heating for the supply of hot water to all dwellings in larger areas.

Note

This memorandum has been confined to the design of houses and the provision of heating appliances. It should be stressed, however, that the mere installation of such appliances will not in itself ensure the use of smokeless fuels. Even with the domestic boiler, which is specifically designed for smokeless fuel of specific character and size, the use of bituminous coal is sometimes found. The equipment of houses for smokeless heating must therefore be accompanied by regulations or legislation to ensure the use of the appropriate fuel. This could be done by extending the provisions of the Public Health Acts so that for specified new houses or housing areas the mere emission of smoke would constitute a statutory nuisance.

★ **This Memorandum is being printed separately and a limited number of copies may be obtained on request.**



Saving Fuel

A NUMBER of exhibitions are being held up and down the country for the purpose of driving home the imperative need for all-round fuel economy. One of the first of these was held at Harrods Ltd., in Knightsbridge, and dealt solely with the saving of fuel in the home. Divided into the separate rooms of the home, with some additional material, it showed what could be done to save fuel with each appliance, fireplace and lighting point.

One looked round the model rooms—dining-room, office, kitchen, and so on—and found numerous red hands on the walls pointing accusingly at sources of waste. Redundant lights, unlagged water pipes, wastefully large open grates, and many more. Most of these behests were practical and to the point, but one or two might be queried. For example, there was the suggestion of no curtains to give a better light. Apart from the effect on morale, this would sometimes save some lighting, but only by a few minutes at dusk or dawn each day. The heat losses from the room, through the loss of insulation that is given by curtains, would be much greater and continuous. Again, the red hand over the bed-lamp, urging no reading in bed. But to read in bed requires only one small light, whereas to sit up and read requires a light and a fire by which to keep warm. Surely we should go to bed early and do our reading under the warmth of the blankets !

One of the most telling exhibits was the panel of photographic transparencies shown above, describing how to avoid waste with water. Water supplies depend on fuel for pumping and pressure, and wasted cold water, as well as hot, represents a serious fuel waste. This particular exhibit was designed by Mr. Rodney Thomas, the architect, at the request of Ascot Gas Water Heaters Ltd., who were responsible for this part of the exhibition.

The exhibition was opened by Mr. Tom Smith, M.P., Joint Parlimentary Secretary to the Ministry of Fuel and Power. In his speech he referred to the work of the Ministry that lay beyond the immediate efforts to save fuel, and he looked forward to developments and improvements in the utilisation of coal. " Progress in the use of coal," he said, " does not content itself with burning in domestic grates."

A Ten Year Plan To End The Smoke Problem

Outline of a Suggested Policy

THE new situation resulting from the war and the need for planned reconstruction appears to have done more to clarify thought on the ways and means for ending the smoke problem than has any factor in recent years. The sharp cleavage between the pre-war and post-war eras makes it possible to divide the problem into distinct sections and to formulate a programme for the solution of each.

The cessation of building, and the planning on a large scale of a future building programme enables a logical approach to the smoke problem to consist of, firstly, the prevention of smoke from future buildings, and secondly, the abolition of smoke from existing sources of emission. The memorandum published recently by the Society deals with the first of these questions, and shows what can be done to ensure the smokelessness of the post-war building, including both industrial plant and housing. Once these, or similar, measures are adopted and remain permanently in force, it will mean that the smoke nuisance will be confined to pre-war sources.

We must not delude ourselves with the expectation that these proposals will be readily adopted and that this important step forward will come with but little further effort. On the contrary, despite their obviousness and practicability we must be prepared for a renewal of the struggle against apathy and reactionary interests. We cannot afford to rest on our oars simply because we know that the creation of new smoke can reasonably and readily be prevented.

And at the same time we cannot afford to neglect the other problem of existing smoke, even though at the moment it may not possess the same need for early decision and immediate action after the war. The two factors of the case are complementary and now that the Society has made proposals for dealing with the first, the second (and in many ways the more complex) has to be studied.

This article is a first and tentative examination of the problem and may be looked upon as the opening of a general discussion in which it is hoped that many members will participate with their own views and suggestions. It must not be regarded as an announcement of the Society's policy. That policy will, in due course, be promulgated, it is hoped, in the form of a series of proposals by means of which it will be possible to bring about the complete abolition of smoke from all existing sources.

We are convinced that not only is it desirable and ultimately will be highly profitable for this to be attempted, but that it is now eminently practicable. We are equally sure that it is going to be no easy matter to secure acceptance of the changes and developments that will be necessary. But the likelihood of difficulties and opposition is no reason for hesitating to formulate a policy. It is indeed desirable, and in the national interest, that a practical policy should be ready by the time the war ends, because it is very probable that the developments that the proposals will call for will be found to harmonise with and support developments of wider purpose that will be needed both for their own sakes and for the part they can play in restoring economic stability and general prosperity. The development of a national fuel policy, for example, is not only necessary on many grounds, but it will be an invaluable means for helping to achieve the "marriage of employment with reconstruction." An intrinsic part of this policy, materially increasing its value, should be the creation of the conditions by means of which the smoke problem can, once and for all, be ended.*

But, it may be asked, can a series of proposals of a practical and reasonable nature really be put forward to make possible the complete abolition of smoke from existing sources? Or are we trying to move forward too rapidly? Let us then, to begin with, consider the broad principles on which a plan could be based.

Three Lines of Approach

Before considering the means—in terms of fuel, appliances, etc.—by which this project could be achieved, it may be useful to examine the methods to be used for ensuring the necessary adoption and use of these means. There seem to be three alternative lines of approach: firstly, measures that would have the effect of prohibiting the emission of smoke throughout the whole country on a prescribed date; secondly, measures that would reduce smoke by progressive stages until at last full abolition was reached; and thirdly, measures that would prevent smoke in its entirety in selected areas that could be progressively extended until at last they covered the whole country.

The first of these methods has been advocated at various times in the past. It would be drastic and uncompromising, but it would be practicable provided that the period between the required legislation being enacted and the date on which it was to come into force, was adequate. There would be, however, many objections to and few advantages in such a spectacular change.

The second method has been suggested by the technical periodical *Coke and Smokeless Fuel Age*, and has been previously commented upon in this journal*. The procedure proposed would be to pass the appropriate legislation making smoke emission an offence, but to put it into force only gradually. Administratively, this appears to have many difficulties and an arbitrariness that might easily lead to a feeling of unfairness and public resentment. Without precise standards of what smoke might be emitted at any given date, the element of chance in procedure would be far too great for equitable reform.

Expanding Smokeless Zones

The third method has the advantage of starting off from what has already been proposed as perhaps the most promising and attainable reform, namely, the smokeless central area. As described in the Society's "Memorandum on Smoke Prevention in Relation to Initial Post-War Reconstruction" the central areas are considered as normally including neither residential nor industrial premises, and because of that they give the opportunity for a relatively easy and straightforward transition to full smokelessness.

Smokeless central areas will be of value in themselves, as a practical demonstration of the reality of smokelessness, but in addition they should be regarded as the nuclei from which can grow entire smokeless towns. It is logical to start with the centre, both because the centre is the most important area of the whole town, and because it is—fortunately—the easiest place in which to start. Once established, advance can be made by adding, stage by stage as conditions permit, adjoining areas. Sooner or later these areas will include houses and industrial premises. Due notice of the change would have to be given to allow any required changes or modernisation of plant and appliances, and one point of importance that will require discussion is whether, and to what extent, the cost of such changes should be assisted.

The legislative requirements, both for the central areas and later for residential areas, would be simple and need not be more than extending the provisions of the Public Health Acts, 1936, so that the mere emission of smoke—irrespective of colour or density—shall in prescribed areas constitute a smoke nuisance under the Acts. As far as individual premises are concerned it would mean in principle a similar tightening of the law, but in practice it might be found desirable, in certain cases, to retain the existing limits of permissible emission. (We should, incidentally, endeavour to overcome the anomaly by which byelaws may be obtained with respect to *black* smoke only).

The rate at which the new areas could be incorporated into the smokeless zone would primarily be dependent

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*See *Smokeless Air*, Winter/Spring ,1942, page 95.

upon the rate at which increased supplies of suitable smokeless fuels for domestic use become available. This concerns the electrical and gas industries, but more particularly (because of the open fire and other solid fuel appliances) the rate at which supplies of smokeless solid fuel can be increased. If our proposals for the smokelessness of *new* housing are adopted the quantities available from existing sources will, by the time smokeless zones begin to be brought into being, be fully utilised. Further, and very large, supplies of fuels, both natural and carbonised, as well as gas and electricity, will have to be made available. The expansion of production will be great and will necessarily take time. The rate at which the smokeless nuclei in the towns can grow outwards will therefore have to be correlated with the fuel position. It will be a programme of steady, progressive development, and it is this factor in particular that makes undesirable the idea of complete smokelessness in one sharp change, as previously discussed as the first of the possible methods.

On the other hand, the advantage of the expanding smokeless zone principle is that it can readily be correlated with the fuel position. It may be that a fairly long time would have the elapse before the final stage can be reached, and still longer before anything is done in rural areas. The low density of smokeless emission in rural areas, however, makes the problem there of less importance and by this method there would be no need to trouble about them until after the towns had been freed from smoke.

The areas to be included, stage by stage, in the smokeless zone could very well be selected according to special local considerations. Thus it is likely that the districts adjoining the central area would be chosen first, then perhaps secondary " centres," districts with special amenities, or districts adjoining features with special amenity value. It seems to be quite probable that a new prestige and importance may come to be attached to smokeless zones and that they will be regarded, as they should be, as places in which it is a privilege to work or live.

A Ten Year Plan

How long would the transition to a smokeless Britain take? Supposing it were to be tackled with something like the same determination that scores of wartime problems are being tackled, and as scores of post-war problems deserve to be tackled. Starting, say a year or two after the setting up of the first smokeless central areas, it would seem that three to five years could bring about the necessary developments and end with all urban areas being made smokeless. But allowing for possible production difficulties and other delays, and not forgetting that none of the reconstruction problems can hope for the urgency to which we have grown accustomed in war, let us be conservative and suggest a period of ten years.

It is difficult to see what material and tangible difficulties could arise to prevent the job being accomplished in ten years, when each year would see a definite step forward. If, in fact, it should not be accomplished in ten years we can even now say that it will be due to those impediments to progress that have so often been experienced in the past—apathy, obstruction, and opposition.

The precise time does not matter, except in one important respect: it brings the question into a sharper focus. It gives it a boundary and makes concrete the task that has to be done. It can be looked upon and acted upon as a plan in which time is an important factor. The great Russian Five Year Plans (to which the whole world now owes so much) would never have succeeded if they had been " next few year " plans.

Definiteness and vigour will be given to the Society's propaganda if our proposals for a smokeless Britain can be framed within a Ten Year Plan. We may indeed start the discussion on the policy required on the assumption that it has to fit such a stipulated period. We believe it can be done.

* * *

This opening of the discussion has covered enough ground to begin with. It has sketched what seems to be the

(*Concluded on page* 54)

Who's Who in Smoke Abatement

J. Johnstone Jervis

THE Society and the smoke abatement movement in general, and the West Riding of Yorkshire Smoke Abatement Committee in particular, owe a great deal to the Medical Officer of Health for Leeds: Dr. J. Johnstone Jervis, M.D., Ch.B., D.P.H. While many medical men are deeply concerned about the problems of air pollution there seem to be few who possess that urgent determination that translates passive conviction into forceful and continued action. Foremost among these few is Dr. Jervis.

As a Vice-President and member of the Executive Committee of the Society, and as Hon. Secretary to the West Riding Regional Committee since its formation in 1925, he has given much of his time and energy, and much fruitful thought, to the fight against smoke. Among all the Regional bodies the West Riding Committee has been one of the most active, most practical, and most successful, and it is largely due (or even more than that) to the infectious interest and resolve of its secretary. The Society's committee meetings and conferences have also been richer through Dr. Jervis's friendliness and wisdom.

He hails from the township of Stobo in Peeblesshire, and is as truly Scottish as any M.O.H. should be, though any Sassenach who expects every Scot to be more or less dour will be totally disappointed with Dr. Jervis. Graduating at Edinburgh University, with later training at London, his first Public Health post was at Croydon. In 1915 he became assistant to the M.O.H. in Leeds, whom he succeeded in 1919. Shortly afterwards the University of Leeds offered him, and he accepted, the Chair in Public Health.

In addition to his work with the West Riding Committee and the Society, Dr. Jervis has represented the Leeds Health Committee on the Standing Conference on the Investigation of Atmospheric Pollution. In 1934 the City and Guilds of London Institute issued a new certificate in Boiler House Practice and set up an Advisory Committee, to which Dr. Jervis was appointed. He was elected Chairman of the Committee and still retains that office.

The short space alloted to this tribute makes it impossible even to mention Dr. Jervis's many valuable papers or to describe the forward-looking quality of his views. But it is significant that at the one wartime meeting held by the Society, for the purpose of deciding whether to sink into a coma or to pursue an active policy, Dr. Jervis should be asked to open the discussion —which he did with a demand for activity that was unanimously accepted. It is significant, too, that the West Riding Committee should be the only regional body that has managed to meet during the war and to express its views on smoke prevention now and in the post-war years. (See *Smokeless Air*, Winter/Spring, 1942, page 100). And it was Dr. Jervis who so aptly summed up the purpose of our present work in a single phrase: " If a phoenix is to arise from the ashes of our devastated cities, let it be a smokeless one."

He says that after the war we shall not be able to afford the luxury of smoke. It will be an opportunity to abolish it, and there should be no half measures.

"50"

AS few readers are likely to have noticed the fact from the contents page, we crave indulgence to sound a flourish of trumpets and to draw attention to the fact that this is the fiftieth number of this Journal. Fifty means nothing to a daily, and little to a weekly or monthly, but for a quarterly that started life more as an experiment than as an enterprise, for a purpose that never before had called for a periodical, it is a matter not without interest and satisfaction.

The first number, which appeared in the autumn of 1929, coincided with the amalgamation of the Coal Smoke Abatement Society and the Smoke Abatement League, and appeared under the title of *Clean Air*. This name did not alst long, for it became known that it was already in use by an organisation of non-smokers as the title of its own bulletin. So the journal became *The Journal* of the Society and continued as such until number 37, when a larger and greatly improved magazine appeared as *Smokeless Air*. Two issues only of this had appeared when the war came and drastic changes had to be made. For a time, indeed, it seemed that publication might have to cease altogether, but, thanks to the loyal support of the Society's members, *Smokeless Air* has kept on keeping on without a break, though with inevitable attenuation. It may surprise readers to know that the amount of reading matter in this issue is pretty much the same as in the pre-war numbers, even though the amount of paper used has been reduced to conform to present requirements. There are, of course, far fewer advertisements and the magazine no longer pays its way.

It may only be our subjective editorial view, but it does seem that *Smokeless Air* is more worthwhile and useful to-day than ever it has been. The contents may be restricted in variety (with so little "news" to record) but they are in some ways more important and more vital than in the days when so much could be done and was done through conferences, meetings and exhibitions.

The first issue featured a number of congratulatory messages, including one from the then Prime Minister, Mr. Ramsay Macdonald, and others from Mr. Lloyd George, Dr. Temple, then Archbishop of York, and the Lord Mayors of some of the principal cities. Number 2 reported many favourable press notices and reviews and quoted a comment from *Nature* which seems well worth quoting again :

> "In the next century commentators will scarcely fail to remark on the fact that in the 19th and 20th centuries, cultivated and intelligent people remained apathetic towards the pollution of the atmosphere by smoke. They will note the display of resistance, active and passive, towards this hygienic reform, characteristic of slum dwellers, yet exhibited by even the most refined who would never tolerate the least defect in sanitation, public and domestic. That the reform is in train can scarcely be denied, and one sign is the appearance of a quarterly periodical . . ."

Many members will remember the rather lurid cover design of those early numbers, which was replaced in time by a series of photographic covers. At first, too, under an arrangement which did not give the Society full control over layout and printing, the style of the magazine was not all that it might have been. The new *Smokeless Air* saw a decided change for the better, and it has been our aim to maintain these new standards despite all wartime difficulties. A recent number was sent in response to an inquiry for information to a technical journalist, who in a further letter said : "To refer to a technical matter of another kind I feel obliged to congratulate those concerned on the very attractive layout and design of the Society's journal. To one who appreciates such things, it is a masterpiece of presentation."

Blushing beneath its blue cover at this unprovoked appreciation, *Smokeless Air* goes forward with guarded optimism towards its second fifty . . .

THE SMOKELESS ZONE PROPOSALS

West Riding Committee's Views

ALTHOUGH none of the Regional Committees have been holding meetings recently, they have been approached by the Society with a view to securing their support for the proposals for smoke prevention in initial post-war reconstruction. So far the Executive Committee of the Greater London Advisory Council for Smoke Abatement has passed a resolution of support and has asked its constituent authorities to do the same, while the following resolution has been adopted at a special meeting of the West Riding of Yorkshire Regional Smoke Abatement Committee :

" That the West Riding of Yorkshire Regional Smoke Abatement Committee generally approves the Memorandum but reserves for further consideration the question of smokeless zones."

As the smokeless zone proposals have generally been accepted, with but few queries or doubts, it seemed that it would be useful to discuss the question further in *Smokeless Air*. In acquainting us with the resolution the Honorary Secretary of the Committee (Dr. Johnstone Jervis) explained the reasons for the reservation expressed in the resolution, and has given us permission to quote from his letter, as follows :

" You will appreciate that the proposal with regard to smokeless zones is one that applies peculiarly to Manchester and has not the same application to every city. The feeling of the Committee was that to have a smokeless atmosphere in the centre and a smoky one outside is not altogether in accordance with the modern conception of Preventive Medicine and rather gives the impression that while people may work and carry on their business in a smokeless atmosphere there is not the same necessity for them to live and spend their leisure hours in an atmosphere of similar purity. To attain the ideal by piecemeal attempts of this sort instead of going all out for it, is perhaps not the wisest way of giving the impression that having achieved smokelessness in the centre, there was, therefore, no need to pursue the matter at the periphery.

" While there was no active opposition to the proposal, there was a feeling that it required further consideration before being accepted as a universal remedy for the present state of affairs in our big towns and cities."

A Note by Mr. Gandy

Mr. Charles Gandy, Chairman of the Executive Committee of the Society, who has been particularly concerned with the smokeless zone conception, writes the following letter :

" I was most interested to hear of the consideration given by the West Riding Regional Committee to the question of smokeless zones. The proposal has now been so generally accepted that it is interesting and stimulating to find it under closer discussion and criticism by a Committee of such experience and in a region where the problem is so important.

" At first sight the proposal may seem more readily applicable to the centre of a very extensive built-up area such as we have in Manchester, but actually in most towns it would be possible to define a business area where smoke emission could be immediately and effectively controlled in this way without much disturbance of installations and with little or no opposition from the occupiers of premises. I do not at all think that such a first step towards effective control of the nuisance would give the impression referred to in Dr. Jervis's letter that buildings outside the controlled area were to be left out of consideration. It is for many practical reasons quite impossible to impose an immediate general control, a principal reason being that while some 36 million tons of raw fuel are at present burned in domestic grates each year, the present total annual production of coke and other solid smokeless fuels available in the home market does not exceed one-fifth of that amount, and that the building up of plant to produce smokeless fuel, whether gas, electricity or solid fuels for use throughout the country, must be spread over some years at least of the post-war reconstruction period.

"Meanwhile, the zoning principle applied not only in central areas but in new housing areas and those zoned for light industry would be felt to be a first step in the progressive control of the nuisance, and one which would, I believe, meet with public approval and be regarded as the forerunner of further developments in the same direction. I have dealt with other reasons for choosing central areas in my article in a previous issue of *Smokeless Air**, and I feel it particularly important that there should be a new orientation in our ideas of town planning, and that instead of regarding those parts of a city that are nearer the centre as the least healthy and attractive, they should claim a first place in the attention of those with a vision of the city clean, healthy and beautiful which we hope to see in the future.

"Perhaps, however, the paramount need for adopting the method of smoke control in specific areas or zones rather than the method of universal control is connected with the framing of the new laws that will be required whichever method is adopted and the administration of such laws. It is worse than useless to make new laws if they cannot be enforced immediately and with certainty, or when the enforcement of them will make demands on administrative machinery or personnel disproportionate to the objects to be obtained. By prohibiting smoke emission first in those areas where its attainment is immediately practicable, administration is made simple and the enforcement of control can be part of ordinary Police duties. This would clearly not be equally possible if, e.g., control could only be effectively exerted over some instead of all buildings in a wider area. While there are good reasons for giving first place to smokeless central areas—making cities clean from the inside outwards—there is no reason why smokeless zones should not also be immediately established on the periphery of cities, both for new building and gradually where conditions are suitable for existing built-up areas."

Means, not Ends

Mr. Gandy's comments, it will be observed, link up with the article on another page on a suggested plan to abolish smoke within a ten year period. This plan, though it is as yet merely put forward for discussion, envisages smokeless zones as the nuclei which will grow into completely smokeless towns and cities.

From this point of view their function, as means to an end and not as ends in themselves, gives them a value additional to other considerations. A smokeless zone, as so conceived, is a stage in a process and not a final objective.

The subject, at this present stage, really demands a conference platform to give us the full benefits of debate that it needs and deserves. It is a pity that this cannot be done at present, and therefore further discussion will have to continue in these pages. Comment is invited.

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*See Summer, 1941, p.36.

STILL AVAILABLE

Smoke Prevention in Relation to Initial Reconstruction

The Memorandum submitted by the Society to the Government Departments concerned with reconstruction, which leads to the conclusion that, with reasonable foresight, practically the whole of the post-war building programme can be smokeless in operation.

No Clean City

An illustrated pamphlet supplementing the above memorandum and showing why it is essential to secure smoke-free cities if the full benefits of post-war planning are to be realised.

Each 2d. *Obtainable from the Society*

TO MAKE LONDON A SMOKELESS CITY

By John Roberts, D.I.C., M.I.Min.E., F.G.S.

Following the article by Dr. G. E. Foxwell on "The Provision of Smokeless Fuels," which referred particularly to carbonised fuels, we have asked Mr. John Roberts to write a complementary article with special reference to the natural smokeless coals. The article considers the problem of London but the reasoning and conclusions may of course be applied to other cities and to the country as a whole.

THE question to which I have been asked to address myself is whether there is any certainty that adequate supplies of solid smokeless fuel can readily be made available to fulfil the demands which would be made as a result of the adoption of the proposals set out in the Memorandum on Smoke Prevention in relation to Initial Post-War Reconstruction, published by the Smoke Abatement Society. I propose to answer this by considering mainly the problem of making London a smokeless city. If it can be shewn that this problem can be solved, it follows that any problem of equal magnitude, although widely dispersed, could be attacked on similar lines.

London's Fuel Requirements

We will first consider the fuel requirements of London. In the year 1935 that city received 13¼ million tons of coal by sea, 6½ million tons by rail, and 50,000 tons by canal, making a total of about 19.6 million tons. Not all of this was smoky coal, nor was the whole of the smoky coal consumed without proper regard to the prevention of smoke. Some of it was burnt smokelessly and efficiently, but much of it was consumed in the usual wasteful and inefficient manner.

The four large London gas companies used about 4¾ million tons of smoky coal, converting it mainly into gas and coke, both of which yield no smoke during combustion.

Of the coal brought into London in 1937, 1,730,000 of it was Welsh coal, including anthracite. The bulk of this was smokeless coal, and 640,000 tons was transported by rail, the remainder being sea-borne. Thus, roughly speaking, at least one-third of the coal used in London was either of the smokeless variety or was subjected to a pre-distillation process at the gas works before being consumed.

The remaining two-thirds may be conveniently split between domestic consumers and industrial consumers. The 8 million inhabitants of London require about 15 cwt. per head per annum, or a total of 6,000,000 tons. Taking into account the coke and smokeless coal used, a reasonable estimate of the amount of smoky coal used by domestic consumers would be ½ ton per head, or 4,000,000 tons per annum. The first target which we have to aim at is the replacement of this quantity by smokeless fuels.

Target No. 1

To be successful in a democratic country, any smoke abatement policy must be applied without inflicting hardship on the community, and any radical change in habit must be brought about by a gradual process. Let us consider for a moment what could be accomplished by the London gas companies alone if they set about to replace the 4,000,000 tons of coal by coke. Before the war an energetic campaign was being conducted to popularise open grates, specially designed to burn fuels of low volatile content, such as coke and smokeless coal. Of the 130,000 per annum sold just before war broke out, it would be safe to say that 100,000 of these were installed in the London area.

Assuming that these grates were used for 240 days of the year, they would consume about 3 tons each per annum. This represents an expanding market for coke at the rate of 300,000 tons per annum. Thus, within 13 or 14 years the gas companies of London could replace with coke the whole of the domestic coal now used in that area. But they would not attack this target single-handed. They would continue to receive the assistance of the hard-coke producers who manufacture coke in coke ovens in the Midland coalfields. They would also be supported by the South Wales smokeless coal producers.

Further, it should be mentioned that in pre-war days over 300,000 tons of coke was exported annually from London, mainly to the Scandinavian market. This coke could be diverted to the home market, and the natural smokeless coals exported instead. This should cause coke producers no concern so long as the home market expanded as anticipated.

Welsh Smokeless Coals

We have now to consider the potential contribution of South Wales. In that coalfield about 5½ million tons of anthracite is produced annually, of which 3 million tons was exported in pre-war days. The total disposable coal in that field in 1937 was 38 million tons, of which between 15 and 20 millions was of the smokeless varieties. If the London domestic market rested between the coke and Welsh coal producers, Wales could easily provide upwards of 2 million tons as its quota, in the form of smokeless semi-bituminous coals, dry steam coals and anthracite. The shipments of smokeless coal from South Wales to London increased by 200,000 tons in one year, from 1935 to 1936. That rate of increase could be maintained for several years.

Here it should be noted that there are several varieties of smokeless coals in South Wales, and if their use is to be popularised in fresh markets, then the greatest care must be used in the selection and distribution of the right types of coals for the different designs of apparatus in which they are to be used. Some consumers may wish to use steam coals in ordinary stool grates, therefore, the producers and distributors must see that coals of 13 to 15% volatile content are available in clean and properly-sized condition for that purpose. It would be fatal to depart much below that range for stool grates. Coals of the type mentioned give excellent service in stool grates, especially when they are fitted with hurdles, and also in bar-type grates (See Fig. 1).

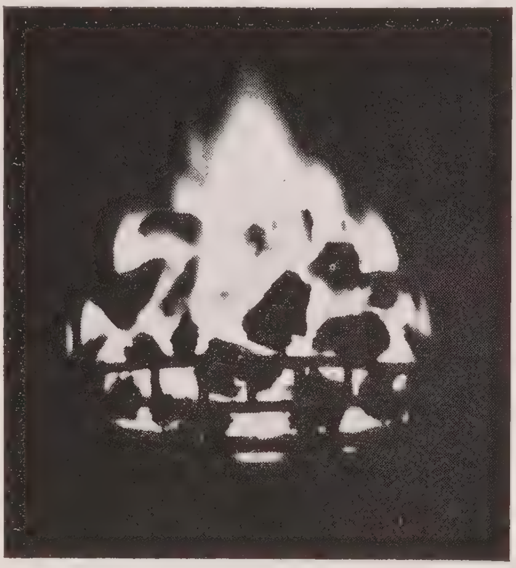

Fig. 1. *Welsh smokeless coal burning in open grate.*

Coals of lower volatile content can, of course, be used in modern grates which were originally designed for coke. They are also successfully used in domestic boilers, closed stoves and stoves of the Cozy, Courtier, Otto, Osobrite and Morsona types. These coals are non-coking, or at most feebly-coking, while coals of the 13 to 15% volatile range have slight to medium coking properties ; the latter also possess the desirable property of "growing," or opening out, during combustion. This accounts for their vigorous combustible properties.

Anthracites are eminently suitable for use in special types of closed stoves and in domestic boilers. South Wales can contribute large quantities, and Scottish anthracite collieries will also provide more than half-a-million tons per annum.

Semi-Smokeless Coals

South Wales also produces large quantities of coals having volatile contents ranging from 16 to 20%. These coals will yield more or less smoke, but practically no soot, depending on the way they are used. Coals of 20% volatile content, however, when started up with a gas poker, preferably of the double-prong type, will yield negligible quantities of smoke, and if fresh supplies are added to the fire at reasonable intervals, while the fire is moderately hot, the volatiles ignite within 20 seconds.

All these coals are coking coals, the coking propensities increasing with volatile content. They ignite readily, and fuse quickly. It is therefore desirable to " ease up " the fire after the first 15 or 20 minutes, before the mass binds too firmly. If this is done, the fuel burns freely and intensely, with moderate flames, and requiring very little further attention. Apple-size cobbles give the best results. Being low in ash, the bar spacings in the grates remain clear of ash, without the necessity of poking or raking.

Points worth noting about these coals are that they generally contain less than ½% of moisture as mined; they absorb very little in wet weather; the volatiles are practically all combustible, as they contain negligible proportions of carbon dioxide and water of constitution. The proportion of heavy hydrocarbons which they contain is low, and what smoke-yielding volatiles they produce are therefore readily ignitable. These coals would become popular with consumers when introduced in the London market. It should be mentioned here that the Kent coalfield also produces a coal which is almost smokeless.

Low Temperature Carbonisation

Among the manufactured smokeless fuels, low-temperature semi-coke must be mentioned. The greater part of the semi-coke produced in this country is made by the Coalite process, and it is well known that it was difficult to meet the demand for this class of fuel, even though its retail price was high in pre-war days. Semi-coke is also being produced at the Rexco works, Mansfield.

All low-temperature processes likely to prove commercially practicable should be developed as far as possible. The solid fuel is very popular with consumers, so it is just a question of production and distribution.

It is obvious that a greatly increased demand for smokeless fuel will result from the wide adoption of special grates. What are the prospects of meeting this demand?

John Roberts

Plans should be prepared to increase the carbonising capacity of the plants to meet the anticipated increased demand. It is true that the throughputs of many gas works plants could be increased, in some cases by 25% on the existing system, but if the yield of gas per ton be not considered as of paramount importance, a still further increase can be effected. The yield of gas *per retort* can be maintained with an increased throughput, by adopting a shorter coking time. When this is done systematically under proper direction an improved coke is produced, which does not necessarily require the use of a special type of grate. The adoption of this system, therefore, would extend the market for coke still wider.

It may be urged that the rapid expansion visualised is impossible, unless a corresponding outlet for gas can be found, but it has been already mentioned that it is the yield of coke, not gas, that would mainly be increased by the method outlined.

Again, it may be objected that it is uneconomic to reduce the yield of gaseous therms per ton. This, however, is contrary to the experience of those who have adopted the plan. In any event, carbonising units could be installed for the purpose of producing coke of the free-burning type suitable for use in open grates. This must be an essential part of the plan of attack.

It is too late in the day to maintain that the process is technically impracticable, inasmuch as open-grate coke has been produced in all types of gas retorts, and in coke ovens of large capacity.

Oven Coke

Oven coke manufacturers just prior to the war withdrew much of their coke from the domestic market, owing to the boom in the iron and steel trade. With their existing plant, they may be unable to assist as much as they should in the campaign suggested. At the same time, it is obvious that the market can absorb the products from a greatly increased production, both of furnace and domestic cokes. The coke oven capacity of Great Britain is insufficient ; therefore, new plants should be erected. It is now well known that ovens can be adapted to produce not only metallurgical and closed-stove fuels, but open-grate coke as well. On account of their great flexibility in this direction, there is a very wide scope for expansion in this business.

We are still faced with the problem of the disposal of surplus gas, if coke ovens produce open-grate coke under high-temperature conditions. It will, therefore, be essential to encourage every departure making for the wider utilisation of coal gas. Naturally, this gas could be used for power generation at the points of production, and gas-filling stations should be erected at nearly all carbonising plants. The greater the number of filling stations available, the more popular will gas propulsion become.

Before leaving the question of coke ovens, it is important to note that low-temperature fuels, and medium-temperature fuels can be manufactured in coke ovens.

It is common knowledge that the medium-temperature process, which originated in England, was, when war broke out, the most widely adopted system on the Continent. This process lends itself to bulk production and great flexibility. For example, an increase or decrease of 50 C. in the carbonising temperatures means a difference of about 14 therms of gas per ton, one way or the other, with comparatively little change of character in the bulk of the fuel. Here then is a well-tried method of producing large quantities of free-burning, open-grate coke (See Fig. 2).

It may also be mentioned that gas retorts may be employed in the same way, if necessary. The retorts may be of the intermittent, or continuous-vertical types, as well as the ordinary horizontal type.

In recent years a few coke ovens have been installed for producing low-temperature coke, three different types of oven having been tried out in the North of England.

Thus we see that the gas and coke oven industries have at their disposal plants for making either coke or semi-coke. It is, therefore, merely a question of erecting sufficient plants, getting into production, and marketing the products.

What we Believe we Can Accomplish

It is clear that with a properly-planned and co-ordinated campaign the problem of domestic smoke abatement in London can be solved without undue difficulty. It is not by any means impossible. Many changes previously regarded as impracticable have been brought into effect during the war to great advantage. For instance, some years ago a Committee considered the

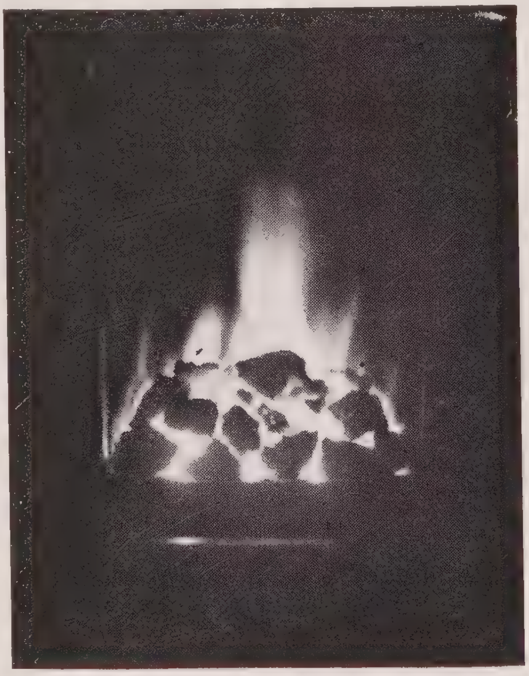

Fig. 2. A medium-temperature semi-coke fire.

question of pooling railway wagons, and decided that it was impracticable, but when war broke out some individual decreed that it must be done, and behold, the change was effected by a stroke of the pen. The result was that the "turn-round" of railway wagons was reduced from seven days to three, thus more than doubling the wagon capacity of the country. Similar beneficial results have accrued from the wider adoption of train-load traffic. Someone once said: "We can accomplish what we believe we can accomplish." We can make London a smokeless city.

So far I have not touched on the industrial side, but I would remind readers that combustion engineers generally maintain that with efficient boiler plant they can burn *all* coals without producing smoke. If we accept this, then it only remains for these engineers to ensure that their principles are applied and their instructions carried out. Here again smokeless industrial coals will make a useful contribution.

The Domestic Coal Trade

Two obvious questions arising from these proposals are: What is to become of the domestic coal trade which has so long depended upon high-volatile smoky coals? Does the proposal involve the closing down of English pits? Not necessarily. Mine owners should realise that such coals are merely raw materials—they are not finished products. The more progressive of these collieries would soon realise that it would be to the advantage of the industry to bring their coals into the condition in which they could be used without the production of smoke. The coal industry should aim at becoming a "finished industry," producing finished products. It can be shown that it is possible to extract 20 to 25% of gas from a smoky coal, while the residue in the form of smokeless fuel would give equally as good radiation in the open grate as the whole of the original coal would have yielded. That gas is not now being turned to useful account, but most of it goes to form smoke. Domestic consumers waste almost as much gas in this way as is made by the whole of our carbonising industries. Can the nation afford to continue this waste?

Conclusion

The proposals briefly outlined in this article involve nothing that is impracticable, but merely accelerated expansion along lines already proved to be commercially feasible. What can be done in London can be done over a wide area throughout the country. The popularity of first rate smokeless fuels, natural and manufactured, and modern fuel consuming appliances has been so firmly established that no insuperable obstacle would be experienced in marketing greatly increased quantities. The means for carrying these proposals into effect in peace time will be at hand. An organisation should be brought into existence to see that they are applied at the proper time, and to attend to the co-ordination of all efforts that would promote the ideal of a smokeless London, smokeless combustion under all new planning schemes, and smokeless atmospheres throughout the country.

Finally, if the expected expansion in the carbonising industry takes place, what is to become of the increased yields of gas, tar, pitch, benzole, etc., that would be produced? The answer is: "When goods increase, they are increased that eat them."

A Ten Year Plan

(*continued from page* 45)

most promising method of progress—the principle of the expanding smokeless zone. It has suggested that this scheme can be completed under a Ten Year Plan. It has referred incidentally to some, but by no means all, the secondary problems that arise and must be considered. The discussion is now open to all. Are we starting to move on the right lines? Are we going too fast or too slow? Are we overlooking some factors of critical importance? Can we draw up and then demand a Ten Year Plan to finish the job?

(*The questions opened in this article should be of concern to every reader. It is hoped that they will write—in the form of a letter or notes—their views on the large issues which before long will have to be accepted or rejected. Every member can help to formulate the Society's policy in what is likely to be its greatest and most promising effort—Ed.*)

Correspondence

Open Fire Fuels

To the Editor
Smokeless Air.

Sir,—I am surprised to note the restricted outlook of Dr. Foxwell with regard to smoke abolition. It would appear that any one who has graduated from the established school of gas works and coke oven thought, is unable to broaden his outlook in terms of imaginary development, to any design or process which will create the "Smokeless Britain" we all seek, without deviating from tutorial training.

Let us face facts now and for the future—we want a clean post-war England—complete smoke abatement, but we can only do this by offering the consumer something which will replace the bituminous coal fire in terms of an alternative *solid* fuel!

My eight years experience in the U.S.A. proved that while our American comrades were efficiently situated with gas and electricity, in its most palatably entertaining forms of application, they too, regardless of cost, longed for a fire in one room and a poker, which seems to confirm that it is impossible to break hereditary custom in less than a century.

In his article Dr. Foxwell points out the potentialities for a solid fuel of smokeless type, such as gas coke from verticals, or a clean metallurgical coke—this procedure would be only a compromise which would ultimately result in failure of purpose.

It is impossible to suppose for a moment that existing design of plant and practice can achieve the radical alteration in domestic conditions which is required. Central heating can be adequately cared for by the available metallurgical coke nuts—gas is already applied in rooms where intermittent heating is required, but where the normal family life is enjoyed, this room requires a fire, one which will not only radiate heat under smokeless conditions, but will also answer the established custom and desire of the Englishman's Home and Castle.

There are available in this country large quantities of high ash slack coal, which could be readily washed and treated in established process for the manufacture of smokeless fuel, a fuel which would replace, and has just prior to hostilities, offered established and severe competition to bituminous coals, without any qualification—it is clean, smokeless, readily ignitable, and radiates heat in a manner unknown to the consumer of the dirty soot-producing raw bituminous fuels.

As regards economy of production and availability of tars, oils and petrol, these processes will prove only too readily the solution to all this talk of conservation of natural supplies, and the suicidal impetuosity of policies compelling the consumer to accept heat in the unnatural form of "gas flame," in place of the "cheery" open fire.

Alteration in practice established since the first open fire was ignited cannot be abolished in a few years: while we agree that our natural resources must be "husbanded" to the greatest degree, let us temper revolutionary changes with modulation, if the country is to become free of soot and smoke. Let us effect this remedy with a sympathetic thought to the consumer, and the desire to utilise the developments of science that have already shown how easily this first step can be accomplished, without compulsion towards autonomy.

Yours faithfully,
Gwynne Cellan-Jones,
F.Inst.F.

Dr. Foxwell's Reply

To the Editor
Smokeless Air.

Sir,—In reply to Mr. Cellan-Jones's letter may I make four points?

1. The question I was asked to answer in the article was the probable availability of smokeless fuels after the war. Rightly or wrongly I conceived it desirable to keep to proved processes and not to invoke the help of "imaginary developments."

2. I do not suggest the use of metallurgical coke for open fires. Some oven cokes and most gas cokes are (or can easily be made) quite suitable for the open fire when burnt in well-designed coke grates. Most of your readers are probably unaware of the great strides made in the design of these grates during the past three years.

3. It is a matter of opinion whether the modern gas fire is in any way inferior in comfort to the open solid fuel fire. Certainly the gas fire economises in coal, creates no dirt and no domestic work. Nevertheless I, too, visualise the continuance of open solid smokeless fuel fires, on a large scale, at least in our time.

4. The work of Mr. Cellan-Jones in manufacturing free-burning solid smokeless fuel is well known to many of us. There will be many who will not want to spend the money necessary for installing modern open-grate fires and the contribution which low temperature or medium temperature carbonisation could make to smoke abolition must not be overlooked.

Yours etc.,
G. E. Foxwell.

" The ABCDs "

To the Editor
Smokeless Air.

Sir,—I read with dismay the letter by Mr. James Law in your latest number which suggests that The National Smoke Abatement Society should become what I have come to think of as one of the " ABCD's." Since the war there has been an intensive breeding of initial-words so that the ordinary mortal, when confronted with anything to do with the services or the government just does not know where on earth he is.

So prevalent has this habit become that I find the young man who assists me in my work constantly coins them for himself, and unfortunately omits to explain to anyone else what they mean. Thus, he has for some weeks been referring to items on the " D.F.D. list," and I have only recently found out that by that he means " Deferred for Duration." If this fashion continues to spread, I shall soon be writing to you in detached letters, instead of in the words of the dictionary.

I have, therefore, made up my mind that for me, at any rate, all ENSA's and R.S.O's and R.P.D.'s (Retail Price Department, in case you don't know) and S.G.O's (that means "Selling Goes On" and is the name of a publication) will be referred to by me as " ABCD's." I should much regret if the National Smoke Abatement Society, ugly as its present name is, became just another ABCD.

Criticism should be constructive. You have a very good name for the Society. You use it regularly. It is direct, understandable, and short. Why not make it the official title? I refer, of course, to " Smokeless Air." Rename the society " The Smokeless Air Society "—and for pity's sake do not then contract it to SAS !

Yours etc.,
Edward Richardson.

The Law of Smoke Nuisances

By W. R. Hornby Steer, M.A., LL.B., Standing Counsel to the Society.

An explanatory and complete text-book. Contains tables of statutes and cases and the relevant sections of the Public Health Acts of 1936.

Price 1/- (*paper-backed*) *and* **2/6d** (*cloth-bound*)

Smoke Abatement and Fuel Economy in Steam Boiler Practice

A practical handbook for those engaged in steam-raising.

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Out of the ashes of our devastated cities a new world can arise . . . . A spacious world, a world of health and beauty, where men and women can live — and work — in warmth and comfort, where their children will grow up rosy-cheeked and bonny. All this is possible, if the will is there to have it.

Men ARE PLANNING for a grand new world . . . architects, surveyors, engineers, scientists . . . Give them the powers and they will carry out the job.

This Association is constantly investigating new and improved methods of heating, ventilating and abating smoke pollution. Its policy is directed towards the most effective use of our National fuel resources.

Open fires which are smokeless, sootless, labour-saving; *automatic* constant hot water and heating; these are the outcome of technical research. The latest developments in heating in the Home, in Industry and in Agriculture, are described in the brochures below.

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Help yourself and the Nation's war effort by using the most economical coal. PhurnoD is slow burning and smokeless; it has a very high radiant heat value, and is the ideal fuel for all types of stoves, domestic boilers and central heating plants. A little PhurnoD goes a long way.

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Ships, towers, domes, theatres, and temples lie
Open unto the fields, and to the sky;
All bright and glittering in the smokeless air.

SMOKELESS AIR

FURTHER restrictions on paper have forced us to reduce our number of pages still further. Some rearrangements of space have been made, and for the time being the "Who's Who" feature is discontinued. But within the space available we believe that this issue is an important one. There is first the noteworthy article by John Patrick, who demonstrates how the means for achieving full smoke prevention can—or ought—to be linked up with the "full employment" policy we hope to see adopted after the war. Michael Fielden's article on the relationship between smoke production and efficient combustion is a valuable exposition of the scientific basis of smoke prevention with bituminous coal—a question still vague even to those directly concerned. And then the discussion on the "Ten Year Plan" is of considerable interest and will, we hope, provide still further discussion. The list of local authorities supporting the Society's reconstruction proposals will also be appreciated by our members.

OUR "smokeless air" photograph above is of Bergen in Norway. The clear and beautiful background, the clean buildings and healthy trees, and the general attractiveness of the scene all lend particular point to the lines of Wordsworth that adjoin our title. Here, as elsewhere in Scandinavia, we can learn much about the efficient and smokeless utilisation of fuel. We reproduce the photograph by courtesy of the Information Office of the Royal Norwegian Government, and should like to take this opportunity of expressing our confidence that the time will soon come when over Bergen, and all Norway, in the air we envy, their flag will again be flying, proud and free.

The Giant Squalor is Sir William Beveridge's apt term for one of the great social evils against which we shall have to struggle if we are to achieve the victory beyond victory. It is an evil to which many factors contribute, and not among the least of them is the grime and drabness of smoke. Squalor in a smoke-ridden atmosphere is squalor intensified. The poverty that is the primary cause of squalor is in fact increased by the vain laborious efforts to keep in check the dirt and dreariness of polluted air. In a more recent speech Sir William described the conditions of squalor and included among them people living too far from country air. What, we should like to ask Sir William, does he mean by "country air"? Surely the air in the country is just—air. There is no peculiar virtue in country air beyond the fact that it happens to be air and nothing more. It is to the town air that Sir William should give his influential attentions. The town air *can* be made clean and healthy, so that the town-dweller can enjoy the benefits of country air not intermittently but continuously. And when that is done Giant Squalor will have lost one of his most powerful limbs.

Many readers will have been interested in the recent press reports of a new type of open fire that will burn coal with but one-sixth of the smoke emission of the ordinary fire. Such a development is naturally of direct interest to the Society, and we recently had the opportunity of inspecting this fire at the premises of the British Coal Utilisation Research Association. It is hoped that it may be possible to give a description of it in the next issue, but in the meantime it may be said that it is a development of great promise, and should notably raise the level of open fire efficiency. It is understood that it will burn any form of smokeless fuel, natural or processed, in addition to bituminous coal.

One of the most important of the Society's proposals for post-war building is that we should adopt the method used in other countries by which all fuel-burning appliances should require the approval of a special authority before installation. We now learn that in Birmingham a voluntary procedure akin to this has been practised since 1936. Arrangements were made with the City Surveyor's Department whereby plans of new buildings and chimney stacks deposited with that Department for approval should be passed on to the Public Health Department for observations. This procedure has enabled the Senior Smoke and Factories Inspector to interview persons concerned as to: (a) suitability of proposed plant and fuel from a smoke abatement point of view; (b) suitability of the chimney stack height as compared with local surroundings; and (c) the keeping of records and details of new plant. We are informed that this scheme has met with considerable success and that it could with advantage be made obligatory. This procedure embodies the principle we are advocating, and its success confirms our belief in the value of this principle. We hope that the experience gained voluntarily in Birmingham will be fully noted and utilised by the Government Departments concerned.

Readers who heard the B.B.C.'s special "Listeners' Brains Trust" feature, in which questions were answered by six typical members of the listening public, would have noted the encouraging replies to Dr. Edith Summerskill's question on what changes they wished for in new homes after the war. Three of the six, clearly trying to avoid the trivial and to mention some larger factor, pleaded for clean air and smoke prevention. This was a significant pointer to the desire, strong yet rarely adequately expressed, for a home in a healthy and pleasant atmosphere.

Perhaps the B.B.C. team was above the average intelligence, or shall we say, awareness, for as a rule the proportion of people who consciously realise the value, to them, of smokeless conditions, is usually much smaller. This is shown in the report of an inquiry on housing carried out in Liverpool and published in the bulletin of the Liverpool Council of Social Service (14, Castle Street, Liverpool, 2).

FROM a series of questions on heating it was shown that there was an overwhelming demand for the retention of the open fire. 174 replies out of 834 declared they would use smokeless fuel, and, the report adds, "the intelligent ones realise the menace of smoke." Though such a division of opinion could be much worse it could also be considerably better. There is of course, among those who are not classed with the intelligent ones, a large amount of prejudice against change, but what is most urgently needed is the creation of awareness of environment.

THE City and Guilds of London Institute continues to hold courses and examinations in boiler house practice—a subject that was inaugurated by the Institute largely by the efforts of the Society. But it is disappointing to note that, in spite of the present major effort to promote fuel efficiency in industry, the numbers sitting for the examination should remain so low. In 1939 the number of candidates was 132, in 1940 there were 36, in 1941 only 3, and last year 13. The Institute hopes, and we strongly support them, that especially in view of present conditions every encouragement will be given for more candidates to take the course and ultimately the examination.

AN interesting point was made in a *Yorkshire Post* correspondence on the interminable debate of houses v. flats. The writer of one letter pointed out that one of the principal advantages of the house as compared with the flat was that the house can have a garden. But in the centre of a city such as Leeds, the letter continued, nothing will grow, and small houses would therefore look far more dismal than well-planned blocks of flats. So the conclusion is that we should have either flats or houses plus smokeless air. We commend this argument to the anti-flattites (if that is a seemly description) for their earnest consideration. Most people do appreciate that there is a real desire among the majority for a house with a garden. But do let it be a garden where flowers will look like flowers.

IN the article in the last issue on a "Ten Year Plan" one of the reasons advanced for the adoption of such a plan was that it might well prove to be a marked stimulant to propaganda and the creation of new interest. From this point of view, which is a most important one, it is more the existence of a plan than its content that is desirable. The press publicity and resulting inquiries that have arisen from the article in which the idea was first mooted are very promising and tend to confirm this view. A clear, readily understood policy, with a definite objective in view, is what the movement has always lacked, and to have this would undoubtedly give the Society's propaganda a new vitality and bite.

PONDER'S End Ratepayers' Association asked Enfield Council to reduce the assessment of houses because of the nuisance caused by smoke. The Council have decided not to comply with the request.

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An Important Contribution by an Economist

THE "COST" OF ABOLISHING SMOKE

By John Patrick

ONE doesn't have to be an economist to demonstrate the fact that smoke is a very costly thing. The evidence is clear for all to see—loss of human health and efficiency, damage to building fabrics, wastage of fuel, ruination of textiles, and the whole familiar list. One would, on the other hand, need to be much more than an economist to be able to assess the total monetary equivalent of this smoke havoc. But most people who have looked at the problem would be inclined to agree that the British community pays tens of millions of pounds every year as the price of burning coal inefficiently. And those people, too, would be inclined to accept Julian Huxley's view that " once we strike our balance sheet in social instead of purely commercial terms, smoke abatement is seen to be profitable and necessary."

These good people, however, are the converted. What about the other chaps ? You suggest that smoke emission is an ugly, unhealthy and expensive pest. They agree. You point out that going smokeless need not mean giving up either the cheery hearth or the delights of poker prodding. They are relieved. You are doing fine. Then suddenly they have a vision of a row of white dials with lone stubby fingers turning this way and that. The inevitable question : " Yes—but what about the cost ? "

A straight question, and fundamental to the issue. Can we afford to go smokeless ? Call in the technician. Call in the economist. Putting their heads together, these gentlemen have little difficulty in showing that, in a wide range of causes :—

(1) On total fuel costs of steam raising it pays the industrialist to use smokeless stoking equipment, employ skilled stokers, or use smokeless fuel grades.

(2) In process heating, improved quality in the product will itself make smokelessness pay.

(3) In domestic heating service, solid smokeless fuel is at least as cheap to use as raw coal.

(4) Sold under appropriate tariffs, gas can be used for all domestic heating purposes at no greater cost than raw coal.

(5) Coke and gas can provide a complete domestic heating service at lower cost than raw coal.

A growing body of evidence could be marshalled to support the contention that solid smokeless fuel, gas and electricity, either alone or in combination, can replace raw coal in most of those uses where raw coal cannot be burnt smokelessly and economically, with operational costs no greater than those of the smoke-producing methods displaced.

But operating costs are only part of the story : it is necessary to consider also the capital expenditure which a thorough-going shift to smokeless methods would require. It is no good convincing the smoke-emitter that he will do at least as well on running costs by using smokeless fuels, unless he is also shown how the mechanical stoker, the coke grate, the electrogas water heater, or whatever utilisation appliance may be required, is to be paid for. And beyond smokeless fuel utilisation equipment, there is the large plant investment required for its increased production. The blue-print of smokeless Britain would include big extensions to generating stations, carbonising plant and gas grids, with additional schemes perhaps, for railway electrification and district heating. The total investment cost of a complete change to smokelessness might be in the region of £500,000,000. For that we should get not only all the benefits of smokeless air, but also a fuel and power supply more complete, controllable and convenient than has ever been known in these islands.

Can We Afford it?

It is, however, fair enough to ask, can we, as a community, afford such an investment? Even against a background of war finance £500,000,000 looks a lot of money. In peace time perspectives it might look impossible: after the present conflict, will expenditure on such a scale be justified, as a means of achieving smokeless air?

Though as a single figure, baldly stated, £500,000,000 may look astronomical, it is not colossal in relation to the investment which has already taken place in the smoke-reducing industries. For instance, the capital invested in the gas and electricity industries by 1939 was already more than £700,000,000 and had increased by over £400,000,000 since 1919. Quite apart from the question of smoke abatement, investments in such plant and appliances may be expected to go forward, just as they did before the war, because the individuals directly concerned find that smokeless methods pay. More gas, electricity and smokeless solid fuels will be demanded, and more equipment will be installed to produce and use them whether there is a deliberate "smokeless air" policy, or not. The net investment cost of smokelessness as such is correspondingly reduced.

Since investment in smokeless methods will continue because it is in the direct interest of the parties immediately concerned, the net cost of a deliberate change to smokelessness will tend to fall in the course of time. There is, however, an important qualification. The net cost of the change to smokelessness will be materially reduced, by gradualism, only if the new installations are in fact, smokeless. This is no imaginary danger. We built over four million houses between the two wars—and almost all of them were smoke-producing. If the recommendations of the Ministry of Health Committee on the question had been adopted in 1920, the capital costs of converting these houses to be smokeless in the future would have been avoided. *The earlier the Government adopts a policy of smokeless building, the lower will be the capital cost of a general change to smokelessness.*

But, taking all these considerations into account, one is still faced with the fact that there may remain a net investment cost of smokelessness amounting to several hundred million pounds, and in a world of uncertainties, this investment is not likely to take place as a normal commercial development in the foreseeable future. There are however, three major reasons why the State might well intervene to promote this investment:—

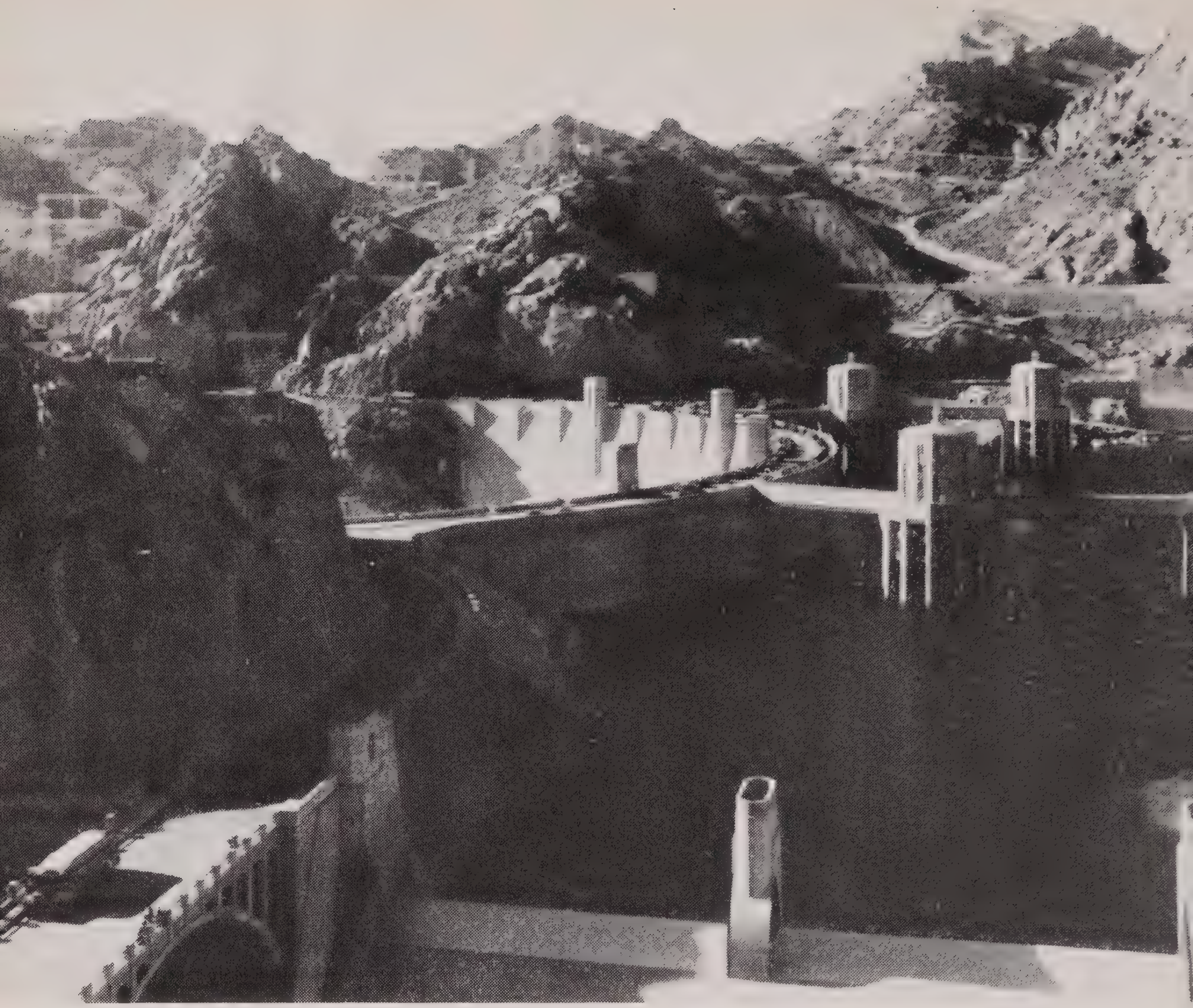
(1) There is a wide margin between the cost of smoke to the community, and to the smoke makers themselves, probably amounting to many millions of pounds annually. To this burden, in part beyond the scope of normal commercial relations, communal action would be desirable.

(2) The State might accept some responsibility for the fuel costs of the distant future. An investment which enabled us to make better use of our coal resources to-day, would, other things being equal, tend to reduce the costs of winning fuel in the future below what they would otherwise be, as deeper and more remote seams would have to be worked in place of those we had recklessly expended. This, too, is a consideration largely irrelevant to commercial bargains of to-day.

(3) But perhaps, the most important argument in favour of the State's promoting investment in smokelessness is revealed by a consideration of recent trends in economic thought.

Economic Depression

Aside from war and fascism, the greatest scourge of modern society, is that condition which tends to precede them both—economic depression, a state of commercial anaemia, with general unemployment of both workers and industrial capacity, and a severe fall in the national income and standards of living. To put the matter at its



Boulder Dam—*famous example of power development, valuable in itself, with a social aim behind its construction. Though this is not necessarily the type of project we shall need in this country it is an outstanding example of the socially desirable large-scale investment projects described in the article.*

simplest, recent economy theory attributes the emergence of this state of affairs to a failure of capital investment to keep up with the amount of saving which people want to do. Modern industrial communities are chronically inclined to save, and this saving provides the means of investment; but whenever the rate of investment receives a check for any reason (and there are many possible checks) people still tend to go on saving as much as ever. The demand for investment goods has declined, but there is no offsetting rise in demand for consumers' goods. Prices begin to fall, business men contract the scale of their operations, workers are dismissed . . . and the vicious downward spiral of the slump begins.

Modern theory takes the view that, to avoid slumps, it is necessary to maintain the level of investment, and advances the further proposition, that a persistent volume of unemployment such as we knew in the period between the two wars could be greatly reduced if investment were at a higher level. In the later nineteenth century, Great Britain was investing heavily abroad, building the railways and public utility systems of half the world—and maintaining a large and growing population in something like full employment; after the last war, our total investment was relatively much lower—and our average unemployment figure very much higher than before 1914. In a recent discussion of the question in *The Economist*, it was suggested that, in the conditions of 1938, we might have had full employment, if the annual gross national investment had been £1,200,000,000, instead of £900,000,000. (In depression years, when unemployment rose very high, total gross national investment sank to about £250,000,000—half what was needed to maintain our capital intact: net investment was negative).

All this suggests that the enlightened government of the future will want to accumulate a programme of socially desirable large-scale investment projects, to be promoted whenever signs of a lag in commercial investment appear. Among such schemes, the investments needed to achieve smokeless air deserve closest consideration, if only on the score of (1) *and* (2) *above—though other arguments could be advanced in their favour.*

Such a programme need not mean that the State would make large handouts to commercial undertakings in consideration of their carrying out the investments proposed. There are various means by which the Government might promote investments in smokelessness without giving the Treasury a major headache. For instance: by a declaration of policy on smoke; with some assurance of market for smokeless fuels; by specifying smokeless equipment for the houses to be built in the future; by arranging to finance the long-term hire-purchase of smokeless domestic appliances; above all, perhaps, by influencing the price and investment policies of the communally-owned undertakings which may be expected to administer a larger part of fuel supply power, and transport in post-war Britain.

These conditions of deficient investment will not occur immediately after the war: for five years we shall have our hands full in making good the wastage and neglect of war. But in 195(?) the possibility of large-scale investments in smokelessness may well be part of the answer to the statesman's prayer.

If this argument is valid, it follows that the true social cost of the investment needed for total smokelessness may be negative, since it may assist materially in avoiding the far greater cost to the community of general unemployment.

The conclusions which may be drawn from this discussion can be briefly summarised:

(1) *On operating costs, the balance is generally in favour of smokeless fuel and power.*

(2) *If the investment needed to achieve smokeless air is properly timed, its social cost may be negative.*

(3) *The least expensive method of getting to a smokeless Britain is by a policy of gradualism—but there must be a policy.*

This means getting the government:

(*a*) *To accept the abolition of smoke as an end of a policy.*

(*b*) *To ensure that all new investments in fuel and power production and utilisation are in harmony with a smokeless air policy.*

(*c*) *To make a programme of investments in smokelessness, for promotion by the State at the socially appropriate time.*

If these conclusions are accepted, where, citizens, is the "cost" of abolishing smoke?

Latest Publications

(1) Memorandum on Smoke Prevention in Relation to Initial Post-War Reconstruction. (2d.)

(2) No Clean City—The Need for Smoke Prevention in Reconstruction. (2d.)

(3) Design and Equipment in Post-War Housing in Relation to Smoke Prevention. (2d.)

(4) Annual Report for 1942. (Gratis).

Obtainable from the Society.

STRONG SUPPORT FOR SMOKELESS RECONSTRUCTION

THE Society's Memorandum of proposals for smoke prevention in initial post-war reconstruction has received considerable support from the selected Local Authorities to which it has been sent. These were those affiliated to the Society, those affiliated to the Greater London Advisory Council for Smoke Abatement (the Committee of which supported the proposals) and the larger non-affiliated authorities. Despite the difficulties prevailing at the present time 81 of these authorities had, at the time of writing, intimated they had considered the proposals and passed resolutions in support.

The list is printed below. Those marked with an asterisk did not refer to specific proposals, but passed resolutions to the effect that the question warrants full consideration by the Government in conjunction with the planning of reconstruction.

It will be noted that the list (to which it is expected further names will later be added) includes most of the larger cities and boroughs. The population represented, in fact, for England and Wales, is over ten millions—more than one quarter of the total population.

It is evident, therefore, that in the opinion of those who are most directly concerned with the administration of smoke prevention measures, the Society's proposals are considered to be practicable and reasonable. It is also clear that there exists, in such responsible quarters, a real desire that the problem should be tackled earnestly in the post-war period.

The list of supporting authorities has been brought to the notice of the Government departments concerned, and it is hoped that it will help to strengthen the Society's case and to ensure full attention being given to the proposals. To what extent they are now being considered we do not know.

In the next issue it is hoped to publish a summary and review of the "Newton" Committee Report—the proposals made and neglected after the last war—which, in relation to to-day's opportunities, is a document of considerable interest and importance.

The list of Local Authorities is as follows:

Acton
Banstead
Bethnal Green
Birmingham
Bolton
Brighton
Burnley
Cardiff
Castleford*
Caterham & Warlingham
Cheltenham
Chester*
Chislehurst & Sidcup*
Crayford
Dagenham
Dewsbury*
Durham R.D.C.
Ealing
Easington R.D.C.
Eastbourne
Edmonton*
Epsom & Ewell
Esher
Felling-on-Tyne
Feltham
Fulham
Gateshead
Grimsby
Hammersmith*
Hastings*
Harrow
Hayes & Harlington
Hereford
Heston & Isleworth
Holborn
Houghton-le-Spring
Hull*
Ilford
Keighley
Kirkcaldy
Leeds
Liverpool
Luton
Manchester
Middlesex C.C.
Motherwell & Wishaw
Newcastle-upon-Tyne
Newcastle-under-Lyme
Poplar
Portsmouth*
Preston
Radcliffe
Rotherham
Rotherham R.D.C.
Rothwell
Rutherglen
St. Pancras
Salford
Scarborough
Sheffield
Shoreditch*
South Shields*
Spenborough
Stoke-on-Trent
Stretford
Sunderland
Sutton & Cheam
Swinton & Pendlebury
Tottenham
Twickenham
Urmston
Uxbridge
Waltham Holy Cross
Wembley
West Bromwich
West Ham
Westminster*
Widnes
Wood Green
Woolwich
Wrexham

THE TEN YEAR PLAN

A Symposium of Opinion

THE article that appeared in the last issue for a plan for the complete abolition of smoke over a prescribed period, concluded with a request that the suggestion be debated.

The comments that follow show in general a broad agreement with such a plan or one on similar lines, but there are a few critical contributions that demand careful attention. In brief, these criticisms may be regarded as saying that any plan for smoke abolition must be preceded by (a) a majority public demand, (b) the acceptance by the Government of the principle of smoke abatement and (c) an analytical survey of the sources of pollution. It is hoped to consider these and other points at some length in our next issue—when we shall be glad also to publish further contributions dealing either with the plan or with this first discussion.

We regret that most of the contributions have had to be shortened, but with the limited space available for this feature the only alternative would have been to omit some of them altogether, and this, of course, was not desired.

End Vacillation

The article entitled " The Ten Year Plan " will doubtless bring criticism. As advocates of a purer atmosphere let us welcome such criticism provided it be constructive. I am of the opinion that we have vacillated too long and should now go forward with a bold policy.

The inherent weakness of smoke prevention has been weak legislation exempting the domestic fire which we all know to be the greater sinner, and the apathy of the public in tolerating these conditions less their own personal freedom be restricted. Nuisances from industrial plants have considerably abated after much patient plodding and education and owners have at long last realised that to produce smoke is wasteful and can be avoided.

The Ministry of Fuel and Power should set up machinery now for producing smokeless fuel in readiness for the demand and statutory undertakings should have a sufficiency of equipment and apparatus ready. Plans should be made for every local authority with a population of more than 10,000 to commence smokeless zones, such zones to be extended until the whole of their urban areas are included within say ten years. What is there against such plans ?—*L. H. Dibblin, Chief Sanitary Inspector, Willesden.*

Co-Ordinate Research

Never was the time more ripe for the formulating of a definite plan to eliminate the objectionable smoke nuisance, for as the Ministry of Fuel and Power with the assistance of voluntary consultants, is causing an appreciable reduction in the coal used in industrial concerns to be effected, with a resultant reduction in smoke emission, it is to be hoped that this Ministry will continue after the war, with added powers for dealing with the smoke nuisance.

As coal is our greatest national asset, and the country will be poorer after the war, there seems to be a strong case for co-ordinating the research work of the coal, gas and electricity industries, in order to arrive at the most economical and health-giving form of heating for different purposes, on the basis of which a limited choice should be given to the consumer. Whilst ten years is a suitable period for the completion of the plan, to enforce regulations on one person, possibly years before another, as in the third method suggested, is a questionable policy.—*Edgar Lunn, Hon. Secretary, Huddersfield Smoke Abatement Council.*

Three-Purpose Range

The ten year plan appears to me an excellent proposition with a reasonable chance of success, if it is accompanied by *brief practical information* as to how it could be realised with little or no extra expense to the householder.

With this object in view I suggest we recommend as a substitute for the all-important ordinary kitchen range a three-purpose range made to burn smokeless fuel. I have one which has an oven, heats the water and can be opened out to give an open fire. It is quite good though not perfect; but as a works research chemist I am confident that a perfectly satisfactory range of this type could be made at a reasonable price if the difficulties were tackled scientifically, and the manufacture were on mass production lines. A satisfactory range is very likely on the market even now, but the prices of the best ranges of this type are too high for the average citizen.—*H. F. Taylor.*

Government Premises First

As the chairman of the West Riding of Yorkshire Regional Smoke Abatement Committee, I wish to make it clear that the opinions which follow are entirely personal. Of the three lines of approach envisaged to end the smoke problem, the third, in which it is suggested that measures be taken to prevent smoke in its entirety in selected areas that could progressively be extended, would appear to be most attractive and likely to achieve success. As in all reform measures, apathy, obstruction and actual opposition must be expected and overcome.

As a first step in setting a good example for local authorities to follow, the Government should put its own premises in order by insisting that all Government property be heated by smokeless means.

Following this, or co-incidentally, every local authority with a population exceeding, say, 20,000, should be required to establish its own smokeless central area, and their proposals to effect this should be submitted to the Ministry of Health in the same way as housing proposals have been called for and submitted for many years past.

Provided that necessary alterations to heating plant are put in hand within a given time, it would be sound policy for the Government to allow subsidy on similar lines to that provided under Section 47 of the Public Health Act, 1936, for the conversion of closets to the water carriage system. Following the establishment of central smokeless areas, and the fillip such action would, without question, have upon the manufacture of smokeless fuels, it might then be a practicable proposition to pass definite restrictive legislation to be applied to all areas.—*John W. Beaumont, Chief Sanitary Inspector, Halifax.*

Protection of Rural Areas

I wish your scheme every success. There is, however, one aspect of the subject to which attention should be drawn. It seems probable that after the war industry will spread into districts which have hitherto remained rural. If and when this happens it will be most desirable to ensure that the atmosphere is not polluted by new factories, not only because of the ill effects that this would have on human beings and animals, but also because the surrounding vegetation might be adversely affected. The ill effects of atmospheric pollution on vegetation are already familiar in the industrial areas of the North and Midlands, and it is most undesirable that any more of our rapidly diminishing, unspoiled countryside should be made unsightly in the same way.

In this connection it is important to realise that invisible poisonous substances in the atmosphere, such as sulphur dioxide, which are emitted even when smokeless fuels are burned, do quite serious damage to the vegetation as well as that which is caused by more obvious solid deposits in black smoke.—*Sir Geoffrey Evans, Acting Director, Royal Botanic Gardens, Kew.*

The Railway Problem

The article on the proposed Ten Year Plan could not perhaps cover the whole ground, but one important factor in promoting a pure atmosphere must be included—the prevention of railway smoke. Railway electrification, both main line and suburban, should be a part of the Society's programme and advocated with vigour.

Not only would such a development bring nearer the Society's objective of pure air, but in itself would be of tremendous value as a means for ensuring full employment when the country is threatened with industrial depression, as it was after the last war. —*Philip Stubbes.*

Enforce Present Byelaws

Dealing only with the question of smoke from factory chimneys, I cannot understand why there should be any necessity for any plan at all seeing that in 1926 the Smoke Abatement Act was passed under which byelaws prohibiting the emission of black smoke could be passed by boroughs, county, and other authorities. Huddersfield passed these byelaws in 1928 and if all the other authorities have not done the same, then I should make the adoption of such byelaws compulsory for any district where there is now, or may be in future, a factory chimney.

Many employers have not done anything like what they could have done to bring their boilerhouse plant up-to-date, but I feel that when this war is over and won, if we continue our work of enlightenment and the authorities promptly enforce fines for any breaches of the byelaws, black smoke would soon be put an end to.

I am looking further than that, however, because I have realised the tremendous saving that can be made by the use of proper appliances. I realise that this saving will be useful in helping to reduce cost of production of goods for the export trade, thus giving us a better chance to export after the war, and it will prevent an indefensible waste of one of the nation's most valuable assets.—*D. R. H. Williams, Chairman of the Huddersfield Smoke Abatement Committee.*

Patent Medicine Parallel

If we are to be democratic, we cannot *impose* smoke abolition—we can only work for the time when the majority will demand it. They will not do so unless a vast educational campaign is begun and maintained, preferably by the State.

To get smoke abolition in ten years in a democracy, the matter will probably have to be taken up by a government department and at least as heavily advertised as is the Save Paper campaign. It takes at least £10,000 to launch a patent medicine, let alone to keep the advertising going. People feel the need of medicines. They do not feel the need (consciously) of smoke abolition. Few people have even heard of our Society. The ordinary housewife will resist changing from fuel she knows to fuel she does not know, which burns differently, and which seems to be more expensive. Consequently I think we should want to spend about £50,000 a year for ten years in publicity to persuade the inhabitants of democratic England to want smoke abolition so badly that they would demand it, and would also put up with any temporary inconvenience or expense it might cause them.—*Edward Richardson.*

Averting the Time-Lag

One may reckon that the ten year plan would go a long way to avert the time-lag which has been so apparent in all reforms. Note the slow progress of sanitary reforms in the nineteenth century, and then compare the phenomenal achievement accomplished under the Five Year Plans in Russia. Any time is no time, and since all of us are more or less afflicted with mental inertia, we tend to grow weary of the apparently endless road we have to travel. Ten years is a fairly long time to look ahead, but it is not the eternity which we seem in the past to have assumed to be at our disposal. Let us press on with a Ten Year Plan for all it is worth. It will be good for the N.S.A.S. and for all the convinced supporters of the movement outside its own membership. It will be very good for the general public because it will give them time to get used to the idea in advance. From the psychological point of view there is everything to be said for it.—*Marion Fitzgerald.*

"Battle for Fuel" Lessons

A general discussion on the means for dealing with smoke from existing buildings is very timely. In the stress of war work many thousands, in all walks of life, have come to realise clearly how much time has been wasted in the past by antiquated methods of providing local heat in private houses and offices. In addition the first "Battle for Fuel" is bringing home the inefficiency and dirtiness of the traditional methods. It will be a great pity if the lessons so learned are allowed to be forgotten as soon as the scarcity of solid fuel is relieved.

Of the three lines of approach

indicated in your "Ten Year Plan," the third, i.e., concentration on smokeless central areas, seems to hold out the best prospect of practical achievement. Manchester has already undertaken useful preliminary work on these lines. The time is probably approaching when it will be opportune to reconsider the details of this local scheme. Meanwhile, I think, you cannot do better than urge an examination of a similar scheme on local authorities in general. In the zone examined in Manchester a great deal of the smoke was found to come from office fires. The electricity supply industry certainly offers the means of abolishing this particular source of smoke to a very large extent.—*H. C. Lamb, Chief Engineer and Manager, Manchester Corporation Electricity Department.*

Smokeless Centre in Edinburgh

There can be no doubt that when peace conditions return, economy in the use of fuel will still have to be practised and the opportunity should be taken to link this with the problem of smoke abatement.

In view of the complex nature of the smoke problem, the ideal conditions may be more easily attained by co-operative movement rather than by drastic or uncompromising action. There is therefore a good deal to be said for the formation of smokeless central areas even to the extent of enforcing this within a prescribed period, having regard to the fact that it is only a matter of adopting modern methods of heating in buildings within these areas. If Edinburgh may be taken as an example, we were well on the way to the accomplishment of a smokeless central area prior to the war for Princes Street, George Street and all contiguous streets.

Regarding industrial plants, many of these are out of date and will have to be modernised when the war is over. It should be no difficult matter, having regard to the modern appliances available, to have this work carried out within a brief time limit.—*Allan W. Ritchie, Chief Sanitary Inspector, Edinburgh.*

Premature to Plan

It is clearly premature to discuss a Ten Year Plan or any other specific plan for rendering this country smoke free, until such time as the principle of smoke abatement and abolition of atmospheric pollution has been accepted by the Government.

The full resources of the Society need to be applied to collecting irrefutable and factual data in support of its contentions—facts which will prove beyond doubt that some kind of legislative action must be taken to ensure that no rebuilding should take place without complete provision of smokeless fuel equipment. Should such provision be made it would be untrue to contend that there will not be sufficient smokeless fuel at the appropriate time.

Any plan—ten year or otherwise—that might be devised after the national and economic need for smoke abatement has been established, must be based upon the reconstructed and newly constructed areas, rather than upon a system such as the central zone of any given cities.

A forceful presentation of the need for smoke abatement is a matter of some urgency since many local authorities have already been advised by the Ministry of Health to prepare housing plans ready for adoption immediately the necessary labour and materials can be released from more pressing war requirements. Rebuilding will begin before the end of the war and once 100,000 houses have been erected without regard for smoke abatement a bad precedent will have been created for all post-war reconstruction and such a precedent will be difficult to overcome. I would therefore urge the Society again to concentrate its energies on the important task of substantiating its case to the point of agreement on action before making plans to carry it out.—*Sir David Milne-Watson.*

Change of Front Essential

The Ten Year Plan suggested is particularly interesting, but unless a complete change of front takes place in the near future any such scheme is doomed to failure. Let there be no delusion about this matter ; the majority of the people are apathetic, or definitely antagonistic, and the reactionaries are numerous and powerful.

To attempt to obtain legislation for the prohibition of smoke on a prescribed date is quite out of the question.

It is too revolutionary and prohibition of any kind cannot be carried out by Act of Parliament, but only by the will of the people, who would not agree to such a drastic change. The second suggestion, to reduce or prohibit by successive stages, would only add confusion to existing difficulties. The law already grants provisional exemption to certain sections of the community, who are now of the opinion that these exemptions were granted indefinitely. " What we have we hold."

The third method, by the extension of smokeless zones, appears to be the only practicable way of reaching a satisfacotry solution, but to achieve such a result in ten years is perhaps too ambitious. Any such scheme must be introduced in conjunction with Town and Country Planning, but it will also be necessary to introduce legislation that will control all sources of pollution in a more comprehensive manner than that alleged to be operating at the commencement of hostilities. These sections of the Public Health Act are weak and obsolete, but unfortunately they have been consolidated into a recent Act in their entirety. Let this Ten Year Plan go forward by all means, but let the plan be practicable and not too drastic in its changes.—*James Law, Chief Smoke Inspector, Sheffield.*

Co-Operation Needed

I would like to say that, as a member of the coal trade, I think it can honestly be said that our industry realises that some form of smoke abatement must take place after the war, but I would like to say also that any antagonism between the coal trade on the one side and the smoke abatement, gas and electricity undertakings on the other, has been brought about by their open and combined efforts to stifle the burning of solid fuel in open grates and consequently to squeeze out of existence one of the oldest industries in the country.

Smoke abatement could be achieved without the abolition of solid fuel and the sooner the coal trade and appliance manufacturers, as well as the gas and electricity undertakings and the N.S.A.S., get together to solve this problem on practical lines, the happier, and in consequence healthier the public will be. -*F. D. Beattie* (*E. & F. Beattie, Ltd.*).

Desperate Demands

Let me hasten to applaud your call for a plan for smokeless air. The first essential is to make the public desire the reform, and I submit that the Society needs to campaign for a propaganda fund and to establish an active publicity department without delay in spite of wartime difficulties, or post-war reconstruction will ignore our memoranda as they were forgotten after the last war.

I suggest a campaign for (1) ten per cent. rates reduction for every house without any open grate (nationally financed) ; (2) flat rate of ¼d. per unit of electricity by national subsidy, for all electricity users ; (3) new housing to be warmed by district heating and chimneys forbidden ; (4) tax on bituminous coal subject to annual increment until none may afford the luxury of being beastly in general ; (5) all soft coal to be converted to electricity and gas by new and modern plants at the coalfields.

These will be considered desperate demands, but it is better far to demand much and be conceded a little than to demand a little and be conceded less.

Money must be brought in for propaganda. Commercial members must be persuaded that subscription to all this is the best advertising investment and municipal authorities must be taught to feel ashamed of their paltry subscriptions of former years.—*Geoffrey W. Stead.*

Health Resort Smoke

The smoke problem in health resorts such as Brighton is not a serious one. At the same time, being in such a fortunate position should not deter those responsible for the prevention of smoke emissions in health resorts from attempting to still further reduce the amount of smoke emitted.

We must continue to draw the attention of the ratepayers to the tremendous toll which smoke claims at the expense of public health and national prosperity, but if we are to do so we must be given the opportunity of carrying out a set programme with as little interference as possible. Surveys must from time to time be carried out, but sight must not be lost of the fact that routine visits and inspections are of the utmost value in keeping standards up to pitch. The importance of the excellent work commenced in many industrial towns of conducting classes for boiler attendants cannot be too greatly stressed, and must be extended to every town where smoke producing plants are in operation. Many local authorities are setting up post-war reconstruction Town Planning committees, and upon these the chairman of the Public Health Committee should serve to ensure that sight is not lost of the important subject of smoke abatement.—*J. Talbot Nanson, Chairman, Public Health Committee, Brighton; Chairman, Sussex Mayors' Association.*

Widen Contacts

It would be a definite step forward towards securing total abolition of smoke from coal by recommending that the problem be dealt with within a stated period of years. It will be essential to secure whole-hearted co-operation of all local authorities' officers dealing with the replanning of our towns and cities.

Prohibition of smoke throughout the country from a certain date is too revolutionary; as a policy, reduction of smoke generally in progressive stages, together with the formation of smokeless zones would create a more satisfactory result. Contact with planning committees and officers of local authorities concerned with building and re-planning will aid our journey in the right direction.—*J. A. Robinson, Chief Sanitary Inspector, Bristol.*

The Sources of Pollution

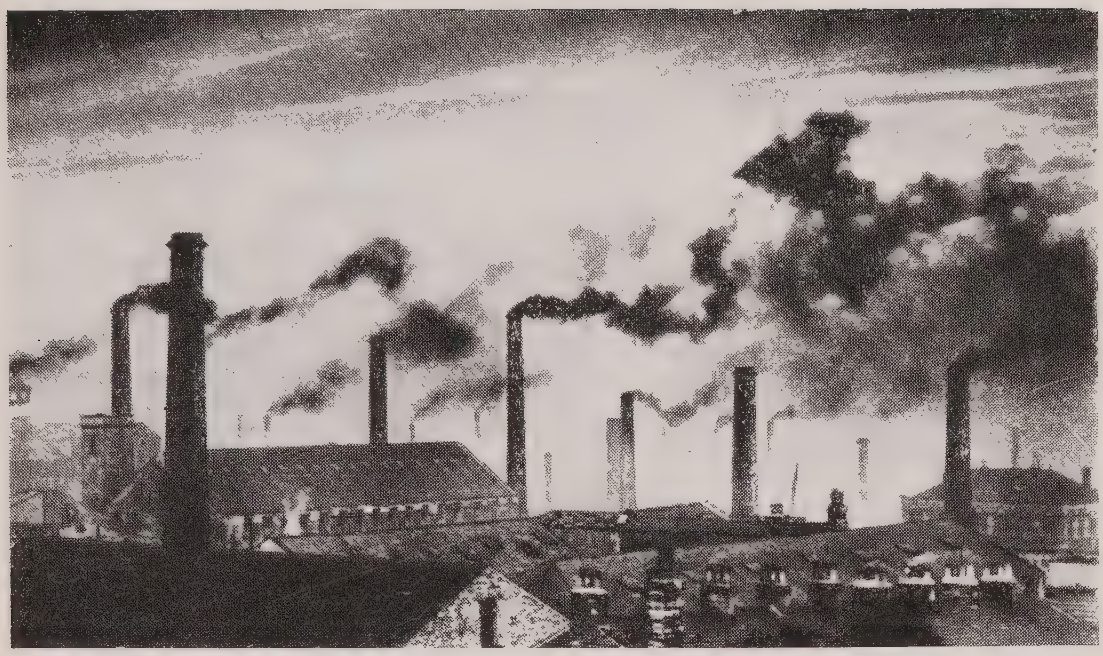
Any plan for the abolition of the smoke nuisance must be based on the solid foundation of ascertainable facts. To the lack of relevant facts must be ascribed the limited measure of success achieved by the indefatigable labours of the smoke abatement enthusiasts, during the last forty years. What little progress has been made, was due more to the gradual evolution of technical,economic and social methods and conditions than to deliberate measures for combating the evil.

In a paper presented to the conference of the Society in Bristol in 1935, I stressed the need for giving closer consideration to the sources of atmospheric pollution in preference to complaining about its effects. Not before these sources are recognised and their technical circumstances investigated, can effective and lasting remedies be devised. Such recognition will lead unerringly to technical improvement.

I then proposed that a survey of the contributory causes of atmospheric pollution should be instituted. Since then some progress has been made in elaborating the technique of testing chimney gases for the three main groups of polluting matter carried by them, (1) smoke proper consisting of sooty carbon and tarry substances, (2) grit and dust comprising ash and coke particles and (3) acid compounds being mostly sulphur oxides. The technical equipment is therefore at hand for examining a large number of typical forms of fuel burning appliances, such as boiler plants varying in size from those in large power stations to small factory boilers, steel and other metallurgical furnaces, pottery kilns, glass furnaces, gas retort settings, hot water installations in hotels, flats, offices and institutions, residential central heating and domestic coal grates, not forgetting colliery spoil heaps and coal screening plant.

By modern statistical methods a limited but adequate number of "samples" of point sources can be selected the total of which will furnish a representative cross-section of the contributors to the general pollution. Conversely the testing work carried on at each point at the required frequency and related to the kind and weight of fuel burned will produce the quantitative values from which the mass of polluting matter can be integrated.

It seems to me that such factual ascertainment is indispensable for the formulation of a policy for the future. It is, incidentally, most likely to yield useful results even in the course of testing as it is bound to disclose inefficiencies in working and thus indicate economically desirable remedies. I submit that the Executive Committee of the Society should study this proposal and work out a preliminary scheme for submission to the Government and that this study should be begun forthwith so that active steps can be taken as soon as circumstances permit.—*Dr. R. Lessing.*



Smoke as Guide to Boiler Control

By Michael Fielden

This article, which is reprinted from "The Engineer," by kind permission of the author and editor, is a valuable and clear explanation of the principles of combustion upon which the Society's case for the prevention of smoke from coal-burning plant must be based. The application of these principles at the present time, by the ways advocated, would materially assist in the saving of fuel.—Ed.

As one who has spent untold hours performing the relatively tiresome task of analysing chimney gases by means of an Orsat apparatus, and who has in later years stood back during boiler tests to gaze leisurely at the chart of an automatic recorder, the writer is in a position to pass on certain observations which at least should prove of value in the present attack on fuel waste. It is a proud moment when one has balanced the combustion taking place in the furnace and flues of a boiler burning hundreds of pounds of bituminous coal or heavy fuel oil each hour, a condition which is attained when the stack-gas analysis shows the maximum carbon dioxide and the minimum free oxygen compatible with clean combustion and non-sooting of water and steam-back surfaces. And from experience, it can be said that a simple observation which can be made by the least technically minded of boiler attendants will prove in most cases as useful as the involved process of gas analysis. In fact, combustion engineers proceed, *a posteriori*, from this simple observation to the accompanying manually or automatically made analysis.

Briefly, there is a critical point in the balancing of the supplies and ratio of primary and secondary air which coincides with the optimum thermal efficiency, which is manifested by a slight haze at the chimney outlet. To give an idea of this condition, a boiler consuming 400 lb. of coal an hour will develop its highest practical thermal efficiency with the emission of appreciably less smoke than is shown at the chimney top of a house in which 4 lb. of coal is being burnt hourly in the domestic grate, the coal in each case containing upwards of 33 per cent. combustible volatile matter. The smoke emission should be no more than is required to produce a distinguishable haze, otherwise an undesirable degree of sooting of the cooler surfaces will occur. Wherever practicable, a suitably placed mirror in which the chimney top can be seen from the boiler house or some convenient nearby position, should be consulted by the stoker at frequent intervals. In most cases it will be found that this arrangement offers little difficulty.

As the combustion performance of an oil-fired boiler is more easily kept on a straight line, and as the principle behind the smoke-haze method of control applies equally to fuel oil and bituminous coal, both being potential smoke producers, it will prove useful to consider first the results of such control as reflected in the waste gas analysis. A typical heavy oil, showing by ultimate analysis about 85 per cent. carbon and 13 per cent. hydrogen, is calculated to give a theoretical maximum CO_2 content of 15-16 per cent. measured by volume in the dry gases. With a trace of smoke at the chimney outlet, the stack gas composition would be as follows:—CO_2, 13-13.5; O_2, 2-2.5; CO, 0.3-0.5.

The mean of the above analyses figures out to a supply of oxygen equal to 3 lb. per lb. of carbon, as compared to the 2.67 lb. of oxygen theoretically required for complete combustion. Thus the air excess, based on the carbon content of the oil, is 13 per cent. Taking the hydrogen content into consideration, and this element is seldom incompletely burnt in the case of oil, the excess of air is, in the typical example quoted, rather less than 10 per cent. These figures indicate the remarkably high efficiency of combustion obtained when the critical point at which smoke is just distinguishable at the chimney outlet is taken as the criterion of optimum performance.

Burning coal with about 5 per cent. hydrogen content, the stack-gas analysis under the conditions described would be as follows:—CO_2, 14-14.5; O_2, 4.5-5.0; CO, 0.25-0.35.

Taking the theoretical maximum CO_2 as 18.2 per cent., the mean excess air is equal to 25 per cent. above the quantity needed for complete combustion, this figure taking into account the hydrogen content which is typical of bituminous coal mined in Britain. Considering the difference in surface/mass ratio between atomised oil and the usual grade sizes of lump coal, the result obtained is better than might be expected. Certainly, with properly designed boilers and good stoking, the combustion described will result in high thermal efficiencies. Pulverised coal is, of course, comparable with oil. In regard to the effect of size of lump coal within the limits of common practice, as also to the manual and automatic methods of stoking, the gas analysis given above needs little correction.

Smoke has been shown to serve a useful purpose, the only one outside of warfare and the " curing " of certain commodities, but it may be said to have one other redeeming feature when considered in relation to boiler practice and thermal losses. It is visible and literally shouts its presence from the chimney tops. To clear the smoke by means of an increased supply of air, by stronger draught, or reduced rate of combustion, is to introduce an invisible loss, which is invariably higher than the 1.5 to 2.5 per cent., resulting from the range of CO previously quoted. In fact, without the aid of gas analysis, it is largely a matter of chance whether the excess of air over theoretical requirements is increased to 50 per cent. or even 100 per cent., undesirable conditions which with coal firing would be reflected by CO_2 readings of about 12 and 9.5 per cent. respectively. The high thermal losses are too great a price to pay for any advantage which may be derived from the complete elimination of smoke. As already indicated, the sooting of boiler surfaces when a trace of smoke is taken as the guide to the most efficient operation is of so small an extent that it can be termed negligible. Hence, whether or not gas-testing instruments are installed, the critical stage at which smoke is just visible at the chimney outlet presents the best and most practical guide to economical operation.

Balanced draught, brought about by

(*Concluded on page* 76)

THE INVESTIGATION OF ATMOSPHERIC POLLUTION

Observations for the Year ended March, 1942

THE full annual report of observations has again not been published, but a summary has been prepared and issued by the Department of Scientific and Industrial Research. The number of observations being maintained by the co-operating bodies has again fallen compared with the previous year, and, compared with 1939-40, the number of deposit gauges is reduced from 127 to 101, automatic filters from 11 to 6, volumetric sulphur apparatus from 12 to 6, and lead peroxide apparatus from 60 to 40.

" The greater uniformity of occupation throughout the country has the effect," says the report, " of simplifying the problems of atmospheric pollution, while Government control of labour and industry makes possible an unusually accurate knowledge of industrial activity. For the first time comprehensive records are being kept of the consumption of coal in different districts, by different industries and by private consumers. A special effort is being made to use coal as efficiently and economically as possible, and a decrease in soot deposit and suspended impurity is likely to occur. These are reasons for making every effort to maintain and increase observations of atmospheric pollution, despite the scarcity of labour and other difficulties which beset the co-operating bodies."

Deposit Gauges

There is strong evidence that deposited matter has increased in Great Britain, as a whole, since the war, continuing the upward trend which was noted a year ago. Comparing results for summer 1941 with summer 1939, from the 87 deposit gauges which were in operation for both periods, there was an average increase of 13% in " soot," i.e., insoluble carbonaceous matter other than tar, and 8% in insoluble ash. Although 11% less rain fell, the average increase in dissolved sulphates was 10%.

The most remarkable example of increased deposited matter is at Southhampton, half a mile north-east of the power station. Here the soot deposit was more than trebled in 1941-42, and the insoluble ash nearly trebled, while total solids were doubled. This is ascribed in part, locally, to the use of inferior and unsuitable fuel owing to the exigencies of war.

There is evidence that air raids have affected deposits in some localities. At one station, fires increased the month's deposit of insoluble ash more than four-fold ; and building operations in a later month were blamed for a nine-fold increase in dissolved matter, including a seven-fold increase in cloride ion.

Sulphur Measurements

A table is published with the summary showing the measurement of sulphur by (a) analysis of soluble matter in deposit gauges, (b) the lead peroxide method, and (c) the volumetric method. (a) gives the sulphur deposited from the air, while (b) and (c) measure the sulphur suspended in the air. The table shows that the figures for (b) and (c) are about ten times those for (a), which means that, if sulphur dioxide is uniformly distributed with height, there is as much in a layer of air 1,000 metres thick as is deposited on the ground in ten days. " It is known," continues the report, " that sulphur dioxide is removed from the air by some physical or chemical process, or else its concentration would increase indefinitely, and the process is likely to be connected with the washing effect of clouds and falling rain."

" The average height of nimbus clouds is about 1,500 metres, and rain occurs at Kew on an average of about one day in two, so that if rain were a perfectly efficient agent for washing sulphur dioxide from the air, it would deposit the contents of a 750 metre layer each day, and the figures for (a) would be about 0.75 times those for (b) and (c). Since this is not the case, the purifying effect of rain cannot be a particularly rapid process. There will therefore be no very obvious reduction in sulphur dioxide concentration after a downpour of rain.

There is additional evidence, in the table referred to, that the soluble deposit of sulphur is not identical with sulphur dioxide in the air, because of differences in the range of annual variation. If suspended sulphur dioxide were deposited within a few score miles of its point of emission the annual range by all three methods would be nearly the same, provided that most of the sulphur in coal leaves the chimney in gaseous form and not, for instance, combined with ash. It is known that most of the sulphur in coal is converted to sulphur dioxide on conversion, so that the argument is valid, and sulphur dioxide cannot usually be deposited within a few score miles of its point of emission.

" The area enclosing Liverpool, Preston, Leeds, Nottingham and Birmingham," the report continues, " might burn a quarter of a million tons of coal for all purposes on a winter day. If the weight of sulphur dioxide emitted is 3% of the weight of coal burned, this would correspond to an emission of about 300 mg. of sulphur dioxide per square metre per day. The rate of deposition of sulphur dioxide is only about one tenth of this, even in the centres of Sheffield and Salford. The conclusion must be that the sulphur dioxide which is emitted in the given area is deposited over a very much larger area. This confirms qualitatively the conclusion of the previous paragraph. The processes by which sulphur dioxide and smoke escape from the atmosphere are not fully understood, but they are important, because if they fail for any reason, abnormally high concentrations of pollution will be set up, endangering health and causing general inconvenience to the community."

SMOKE AS GUIDE TO BOILER CONTROL—*concluded*

intelligent adjustment of the various dampers provided and check observations of the smoke emission, is generally coincident with a small positive pressure in the fire-box, a condition which can be felt by slightly opening the fire-door. Where doors are light in weight and catchless, particularly with oil firing, the optimum thermal efficiency is often accompanied with a quite distinct vibratory rattle caused by the periodic release of pressure. However, these signs are complementary and may coincide with an undesirable excess of smoke. At the same time the relation of these vibrations to the smoke emitted can prove of value to an observant stoker.

Needless to say this note is not intended to be a eulogy to smoke. Neither is it meant to suggest that gas analysis is an unnecessary procedure in boiler-house practice. It is offered as a practical contribution to the attack on fuel waste. Smoke, in the very small quantities referred to, is shown to be a useful index to thermal efficiency, an index that is available with or without the technical aid provided by analysis of the chimney gases. And as many boiler houses are not as yet equipped with gas-testing devices, it is hoped that the information given will prove of value. In conclusion, it should be said that the statements and claims made are based on a fundamental condition, that of good stoking.

" The ABCD's "

To the Editor
Smokeless Air.

Sir,—Your correspondent in the last number of *Smokeless Air*, Mr. Edward Richardson, surely came near to ringing the bell with his suggestion to rename the Society " The Smokeless Air Society." But why cling to that lisping polysyllable " Society " ? May I suggest " The Smokeless Air League " (perhaps adding " of Great Britain " for precision, if you like) ?

The title would suffer to some extent, like the present one, from its implication of " stopping somebody doing something," when its positive aims should be stressed in the Society's name. What ideas have your readers ?

Yours, etc.,

MANCUNIAN.